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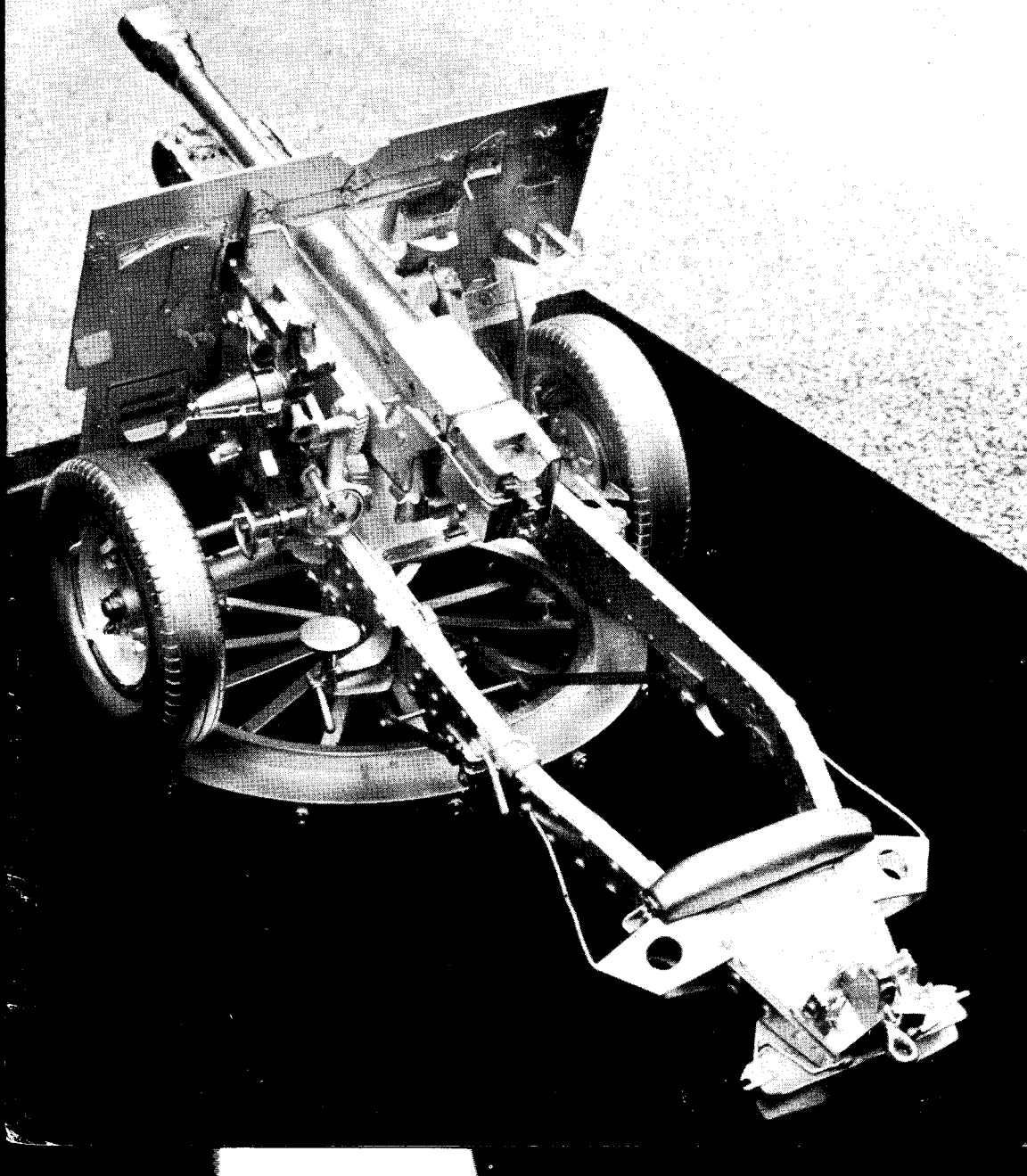
THE MODEL ENGINEER



The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

4TH OCTOBER 1951 VOL. 105 NO. 2628

SMOKE RINGS

Our Cover Picture

● THIS MOST impressive model of a modern 25-pounder field gun was constructed as a team effort by four soldiers serving in the regular army, namely Staff Sergeant Conway and Cfn. Morrison, Copson and Lear, and was entered in the competition section of the "M.E." Exhibition, where it received the well deserved award of a Silver Medal.

So far as our knowledge of ordnance goes, the model is complete and correct to scale in all details, and the information for its construction was obtained from the actual prototype by stripping and re-assembling in the course of normal army training. All components were measured and drawings produced to a scale of 1 in. to the foot. The materials used in its construction is mainly scrap brass. Full recoil mechanism is fitted, although a good deal of detail work is hidden away and never seen from the outside of the gun. The breech block is correct in all details and performs its proper mechanical functions, including the action of the extractors. A complete working dial-sight is also fitted.

In one respect only the model is open to criticism ; that is in the matter of finish, as it is silver-plated and therefore a certain number of marks were inevitably lost on this account. It should be pointed out, however, that there was a definite reason for adopting this particular type of finish, as the ultimate function of the model is to use it as a regimental trophy.

This exhibit was only one of the interesting items on the army stand at the exhibition, which included a number of tanks and other service vehicles. These provided a significant sidelight on the amount of interest now being taken in model work in the regular army, and we understand that every encouragement is now given to service ranks to exercise their skill and creative talent in their spare time, by the provision of workshops and equipment, wherever service conditions permit.

Model Cars

● WE ARE constantly being asked, usually by non-participants, why so little space is devoted to model cars in the "M.E." The answer, of course, is that every subject covered receives an allocation of space commensurate with the interest and enthusiasm communicated to us, in one way or another, by our readers.

It is an unfortunate fact that model car enthusiasts have drifted farther and farther from model engineering, so much so that the fetish for speed and performance has almost entirely superseded the original theme. We say *almost* entirely, because there *are* the minority who have stuck to their home workshops through thick and thin and are at last achieving a high degree of performance ; but even they, in their fervour to compete, have neglected the finer points.

For how much longer is the automobile doomed to be caricatured ? The answer can rest only with those who contrive to model it, but we do feel that, considering the vast store of readily obtainable information at hand, it is a thousand pities that such enormous efforts are wasted by so many to so little effect. A glaring example was a magnificently finished showcase attempt which appeared in the recent

" M.E." Exhibition. There can be little doubt that much thought and contrivance were contributing factors to its existence ; but to what effect ? Precisely *nothing*. Another was someone's impression of a modern roadster : it had to be partly concealed in order to dilute that impression.

We join with a great number of our friends in a plea for better car modelling. We are always willing to advise and assist where possible.

Spenborough Society's Festival Exhibition

● THE FIRST exhibition of the Spenborough Society, recently held in the Town Hall, Cleckheaton, proved very successful. Nearly 3,000 people visited it in the course of its four days opening. The exhibition was officially opened by the chairman of the Spenborough Council, who was introduced by Mr. T. Senior. Some 208 models were on view, together with a model engineer's workshop consisting of a Senior milling machine, Boxford lathe, drilling machine, etc., which were operated by members, giving the public an idea of what a model engineer is, what he does and how he does it.

A very fine model on view as one entered the hall was Mr. W. D. Miller's 7¼-in. gauge L.M.S. " Duchess " class locomotive, named *Duchess of Brighouse*, which came in for a great deal of inspection. Three years were taken up in the building of it and its weight is 7½ cwt. Another outstanding model which was running throughout the exhibition under compressed air, was of a Corlis valve mill engine ; it is 30 years old, stands on a base some 2 ft. 6 in. by 1 ft. 6 in., is a joy to watch and its condition is such that one could hardly realise that it had been in existence for so long. It was representative of a type which was made many years ago by Messrs. Marsdens Engines Ltd., of Heckmondwike, Yorkshire.

Many and varied were the other exhibits ; ships of all descriptions, locomotives, traction engine and threshing machine, machine tools, a showman's engine, a steam roller built from bits of tin, race cars and a stand of beautiful models by that well-known model engineer of the North, Mr. Amos Barber.

Mr. W. D. Hollings and Mr. Bamforth, of the West Riding Small Locomotive Society, kindly took along locomotives and ran the passenger-carrying railway, and several other societies loaned models and helped to make this first exhibition a success.

Oxford's 1951 Exhibition

● ON SEPTEMBER 17TH, the Oxford Society of Model Engineers had the honour of seeing its 1951 exhibition opened in the Town Hall by His Worship the Mayor of Oxford. An excellent display had been collected together, to which the societies at Newbury and Reading had contributed their quotas, and in the spacious hall the layout had been well arranged so that visitors could have a clear view of each exhibit.

The locomotive section appeared to be the strongest, numerically, and it was dominated by Mr. T. A. Bott's fine 3½-in. gauge L.M.S. 4-6-2, *Duchess of Buccleuch*, which had won the Championship Cup at the " M.E." Exhibition only a few weeks before. Locomotives, mostly for 3½-in. and 5-in. gauges could be seen in almost all stages of construction, and the workmanship was of a consistently good quality.

The local championship prize was won by a 1½-in. scale Burrell traction engine built by Mr. A. Newman, a member of the Oxford M.E.S., which subsequently caused the judges some considerable surprise when they were informed that this fine engine is a *first attempt* by its builder ; the quality of the workmanship in it, and the general accuracy of its details would give due credit to many a more experienced craftsman. Incidentally, the castings and parts for this very handsome engine can be obtained from Bassett-Lowke Ltd., though Mr. Newman's model is the first one we have seen completed except for the painting. It was jacked up on the stand and was quietly ticking over under compressed air.

And that reminds us that there was a large number of miniature steam engines, of all kinds and several different periods, connected up to the air supply line and shown working, making a most popular attraction.

Among the boats, the First Prize winner was a 1-in. scale replica of a racing eight of most delicate and accurate construction, complete in every detail from the outrigged rowlocks to the sliding seats for the oarsmen.

We may be hearing more of a rather remarkable radio-controlled model aircraft by Mr. G. Sommerhoff, which was shown in course of construction ; it seems to have been designed to perform almost every known manoeuvre, all by radio, and yet the apparatus it carries takes up very little space.

We congratulate the Oxford S.M.E. upon staging a most enjoyable show.

Secretarial Appointments

● THE INSTITUTION of Engineering Draughtsmen and Designers has advised us that the following appointments have been made :—

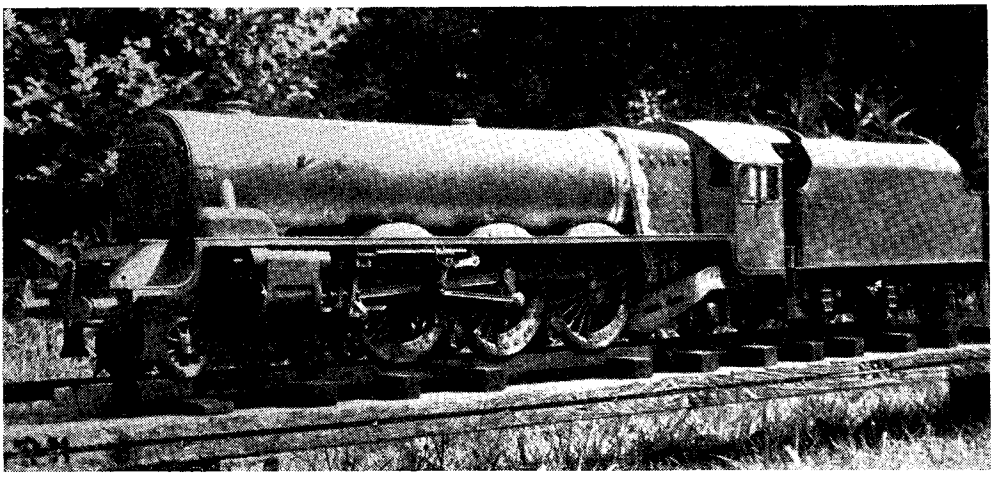
Branch Secretary for the Sheffield area is Mr. E. Garner, A.M.I.E.D., Fairmead, Bolsterstone, Deepear, Sheffield.

Branch Secretary for the Bristol area is Mr. M. H. Macoun, A.M.I.E.D., 12, Westbury Court Road, Westbury-on-Trym, Bristol.

Obituary

● WE LEARNED, with much regret, of the recent death of Mr. J. V. Muller, of Cape Town, who was very keenly interested in model railways. He was ever ready to encourage interest and good work in the hobby, and to this end, he originated the " J. V. Muller Prize " at the " M.E." Exhibition ; this was an annual award to the value of £2 5s. for the best example of model railway equipment. He owned an elaborate Gauge " 1 " railway at his home, and he had himself constructed most of the equipment for it. By profession he was a consulting engineer to a Rand mining company and was closely associated with the building of the Witwatersrand Railway from Venterspost to the Doornfontein Mine.

He was a well-known figure among model engineers in South Africa by whom he will be missed.



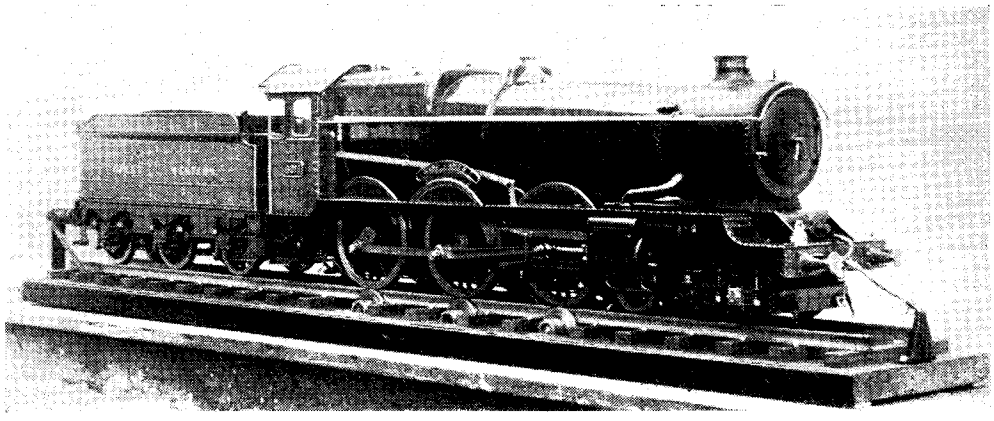
Mr. T. A. Bott's 3½-in. gauge L.M.S. "Duchess" locomotive, prior to finishing and painting

LOCOMOTIVES AT THE "M.E." EXHIBITION

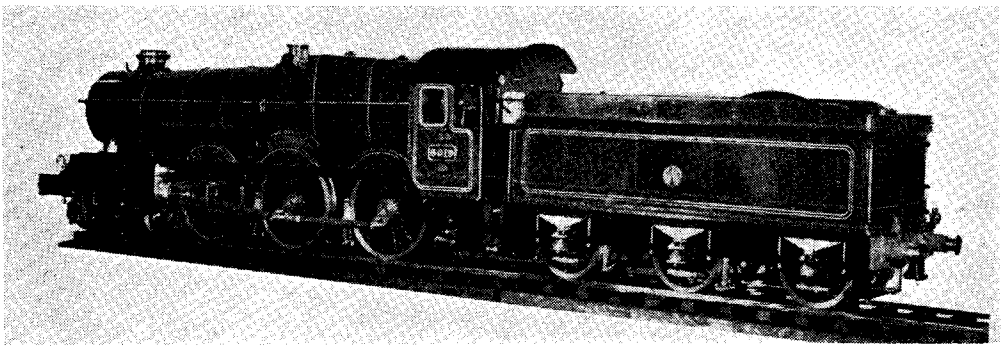
by J. N. Maskelyne, A.I.Loco.E.

I AM afraid it must be said that the locomotives at this year's MODEL ENGINEER Exhibition did not contain one that reached a greatly outstanding distinction. The highest score in the marking of the competition entries was only 82.5 per cent. of the possible total; but, on the other hand, the lowest score of the ten prize-winners was more than 60 per cent., so the marking will be seen to have been fairly close.

To deal with each in the order of the final scoring, Mr. T. A. Bott's 3½-in. gauge L.M.S. *Duchess of Buccleuch* claims first consideration. This fine job won the Championship Cup in this class, chiefly because of the splendid quality of the workmanship and finish combined with a very high degree of accuracy in proportions and details. Incidentally, several visitors criticised this model because it has a *single* chimney. How short is human memory! Mr. Bott's memory and, I expect, his eyes did *not* deceive *him*! There was little on his model that was really wrong; he had made an honest attempt to represent the rather curious machining and finish of the bosses of the prototype's driving and coupled wheels, but failed to get it exactly right. A really puzzling blemish is the finish of the bogie wheels of the model; their tyres, compared with all the other wheels on the engine and tender, were frankly awful, and I for one would like to know why Mr. Bott left them like that.



Mr. J. Refoy's 3½-in. gauge G.W.R. "King" is a fine job, but not accurate in external outline



Mr. L. H. Cheesman's 5-in. gauge G.W.R. "King" embodies some beautiful workmanship, but also has some puzzling faults

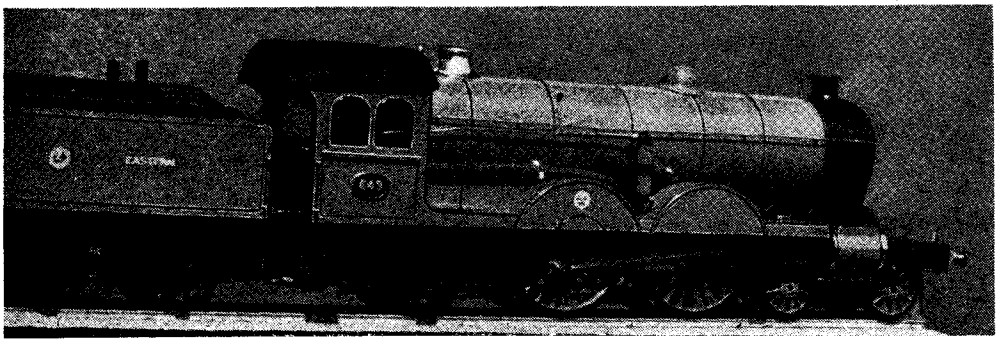
An extremely interesting and fascinating feature of this exhibit was the beautiful riveting of all the plate-work; the rivets are to scale, varied in size where necessary, and in perfect line throughout. I have never seen riveting better done, even in larger models, and very seldom indeed have I seen the *sizes* of the rivet heads varied where it ought to be varied. Further, Mr. Bott's were correct in number and spacing; consequently, they looked right and very different from the huge, clumsy blobs that are usually seen and which never look right, no matter how carefully they may have been arranged. I strongly dislike over-accentuated riveting on a model locomotive, but when it is nicely and correctly done it is a treat to see.

Mr. J. Refoy's 3½-in. gauge G.W.R. "King" class locomotive won a Silver Medal, mainly on its merits as a fine piece of craftsmanship; as a "portrait" of a "King" it leaves a great deal to be desired. I have an idea that the model has been built to a drawing that has unnecessarily distorted the external dimensions; otherwise, I am at a loss to explain some of the errors. The boiler is too high; neither the chimney nor the safety-valve casing is correct in size or shape, and the body of the tender is too low. The painting has been quite well done; the colours are correct, but I must point out that there were no square corners in G.W.R. lining, and the square corners that Mr. Refoy has in the lining of his cab-sides spoil the effect.

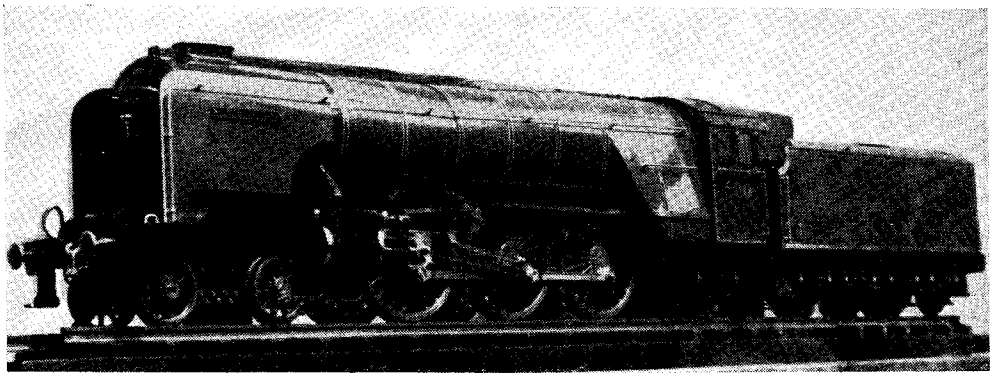
However, compared with the high standard of workmanship consistently maintained throughout engine and tender, including the complication of four cylinders and a working water pick-up, the errors I have mentioned are incidental rather than vital, and the model fully deserves the award it gained.

Mr. L. H. Cheesman's 5-in. gauge "King" is another magnificent job that does not come up so well as it might to representing the prototype. This job is so close to scale that the failure to achieve greater accuracy in the general outline is puzzling. The joint between the boiler barrel and the firebox is too high and the backward slope of the firebox top towards the cab is too steep. The rivet heads are all too large and too prominent, the painting, while nicely finished, is not the right colour and the lining is much too heavy. At the same time, much of the mechanical work on engine and tender seems to be unduly massive; granted that the chief desire was to build a *working* engine, this need not involve making the working parts much over scale size, which usually introduces awkward problems of its own, not to mention waste of material. However, the sheer industry, patience and craftsmanship obviously put into this job merited its Bronze Medal.

Mr. W. Tucker's ¾-in. scale N.E.R. Class V 4-4-2 locomotive is a very fine example of combining a *scale* appearance with good working qualities. Generally, not so elaborate as the engines just mentioned, it is, nevertheless, very



Mr. W. Tucker's 3½-in. gauge N.E.R. "Atlantic"—a splendid example of accurate external appearance



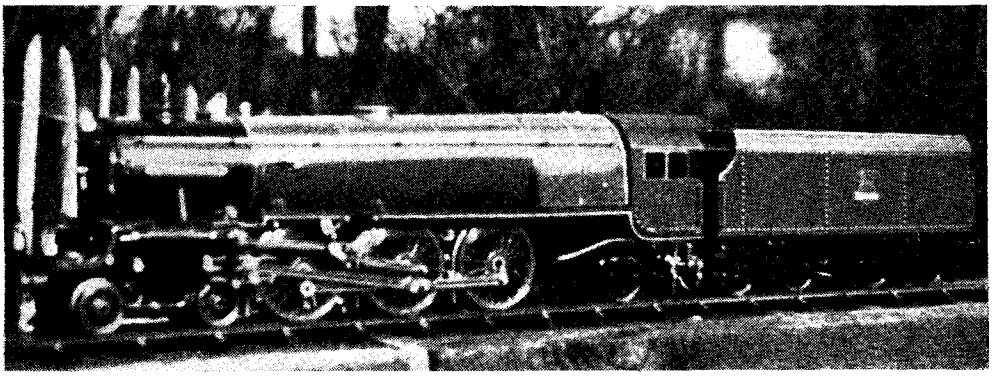
Mr. F. L. Smith's 3½-in. gauge Eastern Region 4-6-2 locomotive is an outstanding version of "L.B.S.C.'s" "Hielan' Lassie"

close to scale in all its details. One ingenious little feature that I noticed was the Westinghouse brake-pump ; correct in all its external visible details, it was not exactly a dummy, for Mr. Tucker had adapted it for use as a lubricator ! This sort of thing could be done on most miniature locomotives and is always worth while. I heard several criticisms of the very vivid green that Mr. Tucker has used for painting his engine ; but, to my mind, it is as near correct as I have ever seen in a miniature N.E.R. locomotive ; the only improvement that I could suggest for this engine would be a brass cap on the chimney, since the prototypes were so fitted for some years when they were new. This exhibit won a V.H.C. diploma and the Michael C. Bradbrooke prize for the best 3½-in. gauge, coal-fired, passenger-hauling steam locomotive.

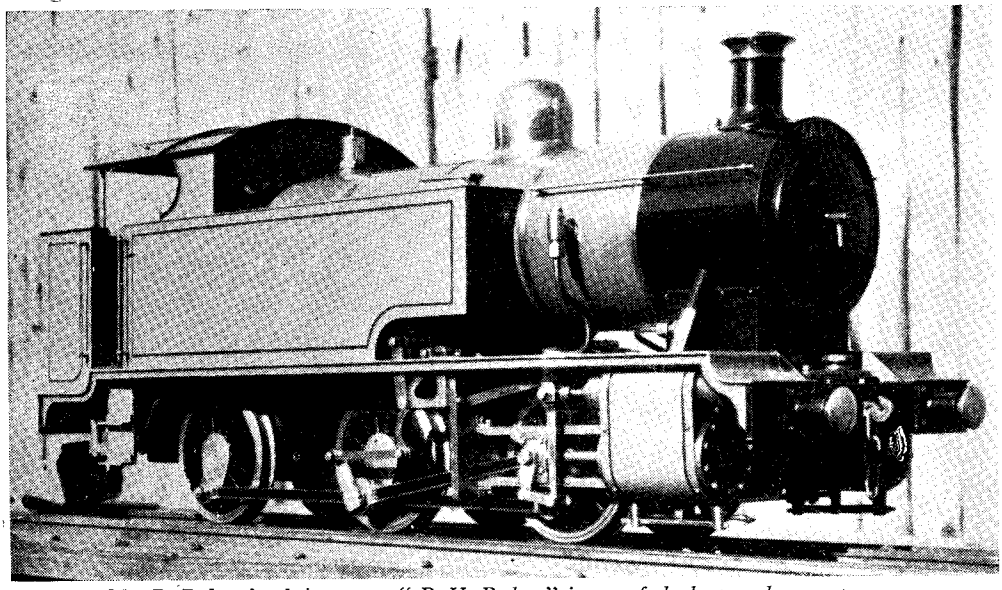
The 3½-in. gauge Eastern Region 4-6-2 locomotive by Mr. F. L. Smith, of Bamber Bridge, also won a V.H.C. diploma. This engine is based on "L.B.S.C.'s" "Hielan' Lassie," but it embodies some detail additions and modifications which, to my mind, in no way lessen its capabilities and considerably improve its appearance. It is well finished throughout, and the painting is very good indeed. The riveting is neatly done, and everywhere on the model, the fitting and finish are good. The coupling-hooks and links could be more like the prototypes, with advantage, and stronger in consequence, while the dummy brake connections ought to be rather larger and longer.

A "Highly Commended" diploma was awarded to Mr. F. S. Watson for his very interesting 10-mm. scale free-lance 4-6-2 locomotive and tender, which is one of those very rare examples of "free-lancing" that produce a result which could be reproduced full size with success. It is a fine job, full of excellent detail, especially as it is a three-cylinder engine with conjugated valve-gear arranged behind, instead of in front of, the cylinders. The motion and all the working parts are nicely to scale and very well proportioned. I thought, however, that the painting rather lets the job down ; not that I dislike the livery, which, after all, is very like the present blue livery for British Railways' express passenger engines, but its general finish all over could be much better.

Mr. E. R. Uphill's version of the L.M.S. 0-6-0 dock shunting tank engine for 5-in. gauge is a very nice piece of work and commendably accurate in its general details. Its duplex feed-pump is worth study on its own and not too unsightly, in spite of its prominent position. The paint is a trifle too glossy to be realistic, and the screws used for such details as the cab window-frames



Mr. F. S. Watson's Gauge "1" three-cylinder 4-6-2—an example of successful free-lance modelling



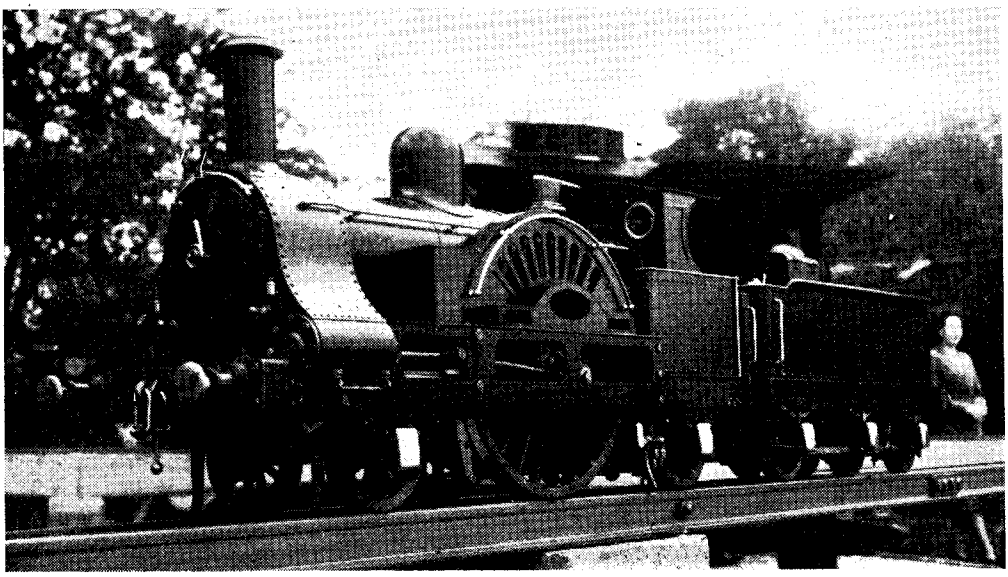
Mr. B. Palmer's 3½-in. gauge " P. V. Baker " is one of the best we have yet seen

are unnecessarily large, probably due to prevailing shortages and, therefore, excusable. An " H.C." diploma was the award in this case.

I have seen several examples of " L.B.S.C.'s " popular 3½-in. gauge 0-6-0 tank engine *P. V. Baker*, but Mr. B. Palmer, of Sheppey, may be interested to know that his is one of the very best that I have seen, so far. As is the case with most of this year's prize-winners, neatness and good workmanship were responsible for the award of a prize, once more an " H.C." diploma ; but the judges decided that this exhibitor was so obviously a tryer as to deserve still further encouragement, so they awarded him the " Wilwau " prize in addition to the diploma.

The 5-in. gauge version of the old L.N.W.R. 8 ft. 6 in. singlewheeler, *Cornwall*, by Mr. A. D. Pole, of Harrow, attracted a great deal of attention, not only from visitors but also from the judges,

(*Continued on page* 444)



Mr. A. D. Pole's " Cornwall " is one of the most interesting locomotives yet built for 5-in. gauge

IN THE WORKSHOP

by "Duplex"

No. 99.—Some Workshop Lighting Fittings

AMONG the useful apparatus for workshop lighting a floor lamp must be mentioned, but the type of fitting to be found in most households is not ideal, for such lamps are incapable of adjustment.

A workshop floor lamp must be capable of being adjusted to permit the bulb and reflector to be set at any height and at any angle necessary for comfortable working. The device should be as light in weight as possible, consistent with adequate mechanical strength, the means of adjustment should be simple, and the lamp as a whole should, of course, stand firmly on its feet. There is also some advantage if the lamp can be quickly dismantled for storing away in a small space when not required.

A lamp fulfilling these requirements is illustrated in Fig. 1. This fitting is one of a pair made, originally, for floodlighting purposes when photographing machinery; but they have been found of equal value in illuminating work on the bench, in the vice, as well as when set up on different machines. These lamps can be stood in any convenient place on the bench when necessary and the light brought over the work by extending the horizontal beam that carries the reflector and lamp-holder.

As will be seen from the illustrations, the device consists of a tripod foot and a vertical column for carrying the horizontal beam previously mentioned. This arm is provided with a simple adjustable friction hinge joint to allow the reflector to be set at any desired angle, over the work in hand.

The top of the vertical column is some 6 ft. from the ground, and this has been found high enough for all practical purposes. The design of these lamps is of the simplest, enabling them to be made from materials commonly found in the workshop.

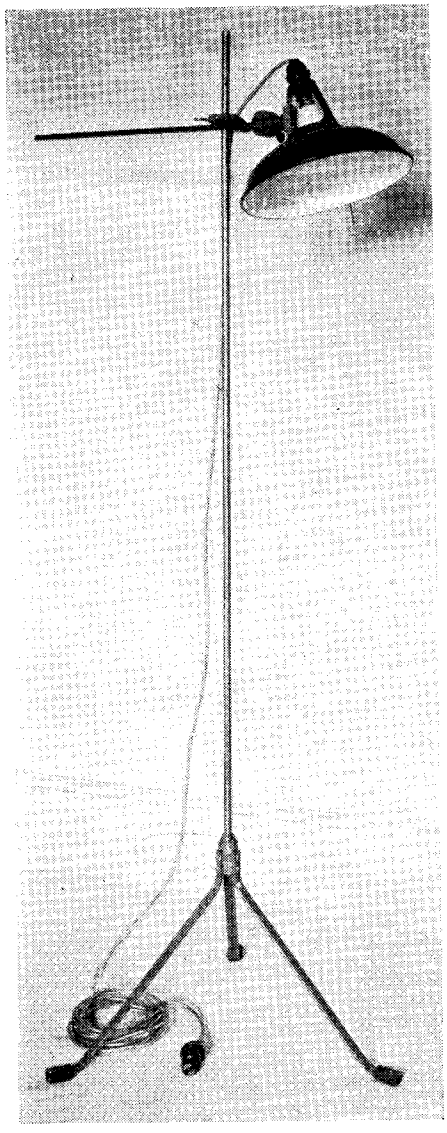


Fig. 1. A simple workshop floor lamp

The Foot and Column

As will be seen from the illustrations and the detailed drawings, Fig. 2, the foot of the device is made by securing three iron legs, previously bent to shape, to a piece of hexagon material. This hexagonal member is drilled axially to accommodate the column made from a length of $\frac{1}{8}$-in. diameter bright mild-steel rod.

In order to provide resilient pads for the tripod legs, short lengths of $\frac{1}{2}$-in. bore water-hose are pushed over the ends of the legs, as seen in the illustration.

The Column Clamp

The clamp illustrated in Fig. 3 is an adaption of the fitting commonly employed in laboratory apparatus. Indeed, if so desired, laboratory fittings may be bought from Messrs. Baird & Tatlock and used for the purpose. If it is decided to make the clamp in accordance with the drawing, the work can be carried out in the four-jaw chuck, and the part filed to shape once the bulk of the material has been removed by taper turning. With regard to the wing-nutted clamping screws illustrated in Fig. 4, A and B, these parts are of two different sizes and are best made by screwing standard

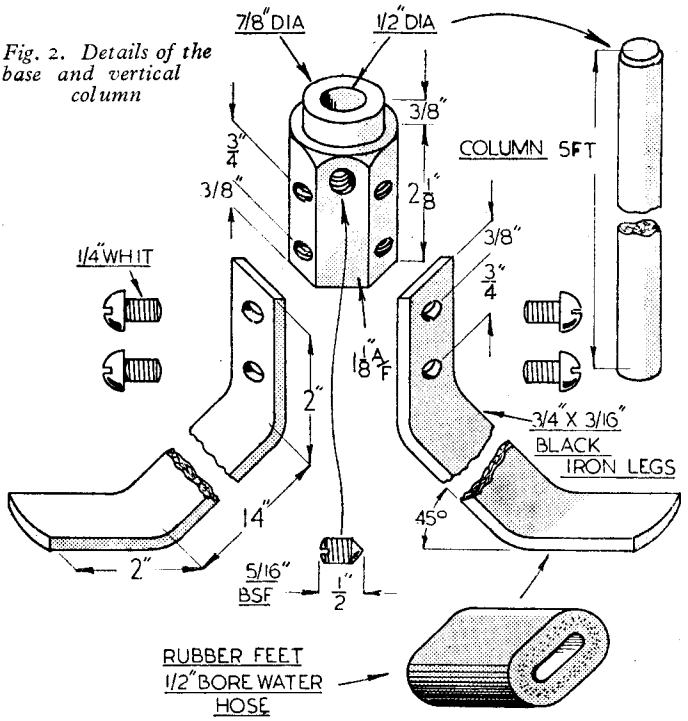


Fig. 2. Details of the base and vertical column

Whitworth threaded wing-nuts, such as can be brought at most ironmongers, to short studs threaded at one end to fit the clamp body and at the other to take the wing-nut. If the nut is made a firm fit on the stud, there will be no danger of the two parts coming loose after they have been assembled together; however, if there is any doubt on this point, the wing-nuts should be cross-pinned to lock them to the studs.

Whilst on the subject of the securing or locking-screws, some may prefer to dismantle the floor lamp when it is out of use. In these circumstances the grub-screw, shown in the detail drawings, holding the column in the base, may be discarded; a wing-nutted securing screw should then be provided instead, as an aid to rapid dismantling and assembly.

Some advantage is to be gained if a half-round groove is machined at the lower end of the column. If the end of the locking-screw is shaped to fit correctly in this groove, the whole lamp may be swung on the foot and then locked in any desired position. When the lamp is set on the bench, this is much simpler than slackening the column clamp, as this clamp may well be out of reach.

The Beam, Friction Hinge Joint and Reflector Mounting

The several parts of the friction hinge joint and reflector mounting are illustrated in Figs. 5 and 6. The machining of these components needs no detailed description, for the work is straightforward.

The friction afforded by the metal-to-metal contact of the two joint discs may be adequate without the interposition of additional friction material. Firmness of the joint can, however, be greatly increased if two discs of medium emery-

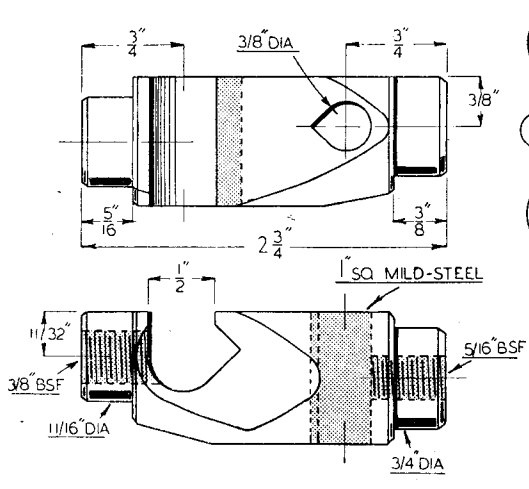


Fig. 3. Details of the column clamp

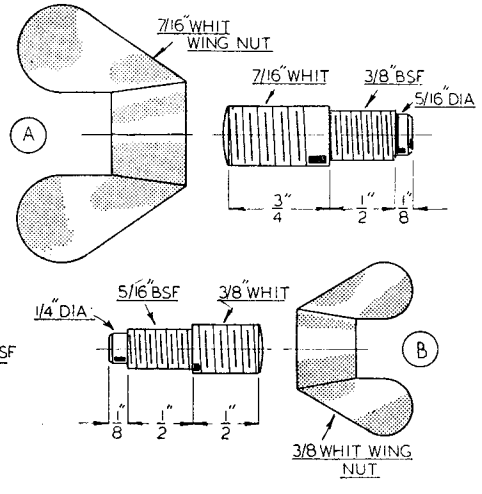


Fig. 4. Details of the clamping-screws

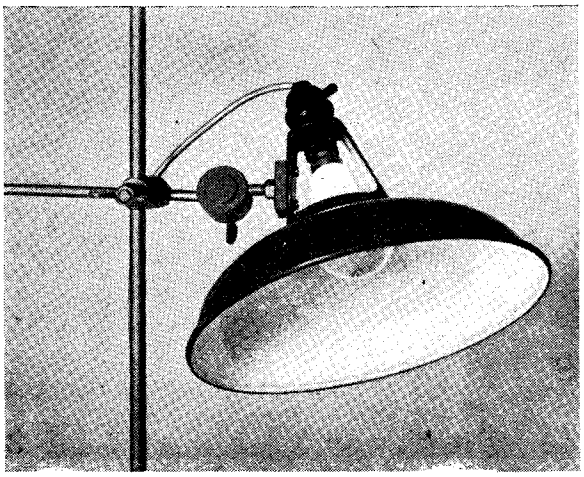


Fig. 5. The lamp-head, showing the horizontal beam, friction joint and reflector mounting

cloth, glued back to back, are placed between the metal discs.

A strong compression spring is needed for the friction joint. This part may be obtained by cutting a motor-car valve spring in half, and squaring the ends by grinding. The method of carrying out this work has been described in an article on springs published in THE MODEL ENGINEER for October 26th, 1950.

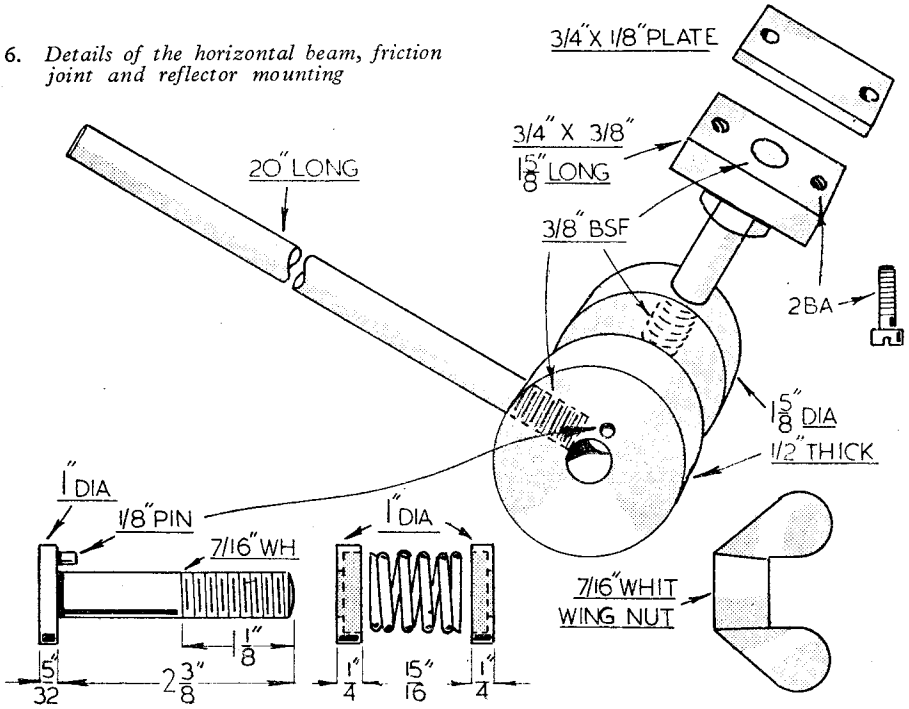
As will be observed, the spring is retained in two cups. These fittings prevent the central bolt unscrewing in the wing-nut when the reflector is moved.

The reflectors used are of the industrial pattern, having a hard vitreous green enamelled exterior with a white internal finish. Two sizes have been used; a large reflector 14 in. in diameter, and the smaller fitting seen in the illustration. This reflector is 11 in. in diameter, and, unlike the 14 in. fitting, is provided with ventilating apertures of large size. The reflector seen in the illustration is not, perhaps, ideal for photographic purposes. However, by making a small metal shield to cut off the light projected through the ventilating louvres, or even by draping a black cloth over the top of the lamp, the reflector can readily be made serviceable for use when taking photographs.

Set against this possible disadvantage, when consideration is given to the problem of attaching the reflector to the hinged friction joint, the construction of this type of fitting offers distinct advantages. There is no difficulty in drilling through the vitreous enamel if a small sharp drill is used at the start.

In order to simplify the work, the $\frac{1}{8}$-in. reflector clamping plate is first drilled with a No. 50 drill and then used as a jig for piercing the reflector, an operation that is best carried out with a hand brace. After this has been done, no difficulty will be experienced in opening up the holes to $\frac{3}{16}$ in.

Fig. 6. Details of the horizontal beam, friction joint and reflector mounting



in the drilling machine, if the work is supported on a piece of wood, and the drilling is carried out in two stages, using first a $\frac{1}{8}$-in. drill, and then following with one of $\frac{3}{16}$ in. diameter. A moderate speed should be employed. In this way the tools will be saved from damage, moreover, there will be no damage of splitting the enamel surrounding the holes.

Lamp Fittings and Wiring

The most convenient form of lamp-holder for use with the floor lamp is a switch-holder. This type of fitting enables the light to be controlled from the lamp itself and avoids the trouble of going right back to the wall plug to switch on and off.

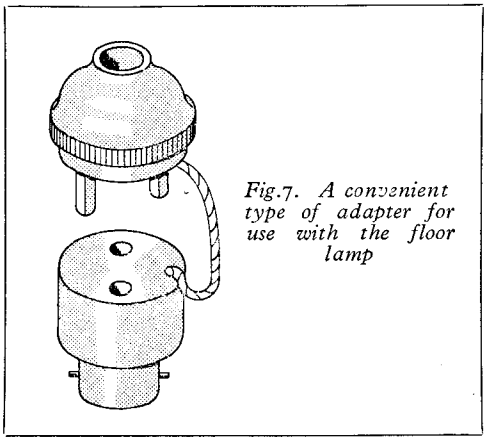


Fig.7. A convenient type of adapter for use with the floor lamp

The connecting cable should be strong and able to resist the unavoidable wear and tear in a workshop.

Before leaving the subject of the connecting cable, mention must be made of the connector. The most useful fitting to employ is that known as a Bayonet Cap to two-pin 5-amp. adapter. This device is illustrated in Fig. 7. By means of this fitting, the cable may be readily connected, either to an ordinary lamp-holder or to a wall plug.

Lamp Bulbs

Except when using lamp bulbs of high intensity for photographic work, there does not appear to be any advantage in using lamps of more than 60 watts. The reflector concentrates the available light over a good working area and an increase of illumination at the source is, perhaps, somewhat trying to the eyes. Moreover, experience seems to show that the life-factor of the lower wattage lamp bulbs is greater than those of high candle-power. The type of lamp suitable for these fittings is that known as " Rough Service, Gas Filled." These lamps are made in wattages of 40 and 60, and they are especially designed for conditions where mechanical shock is likely to be sustained.

(*To be continued*)

Locomotives at the "M.E." Exhibition

(*Continued from page* 440)

especially myself! It is something quite out of the ordinary, and I hope that it will prove to be satisfactory on the track; it seems to have behaved quite well, so far, during its running-in period. As is only to be expected from Mr. Pole, the workmanship is good; there are a few superficial errors of detail which, no doubt, can be corrected later on, if desired. The engine is much more simply arranged than is the prototype, in that Mr. Pole has adopted horizontal steam-chests set at the height of the driving-axle centre-line, thereby avoiding the necessity for introducing rocking shafts between the valve-rods and the valve-spindles. The general proportions of this engine are excellent, even in its photograph, but I could wish that the lining had been done better and more correctly. A " C " diploma was awarded.

And now I come to what was, in some ways, the most startling of all the steam locomotives ever to be seen at the MODEL ENGINEER Exhibition; it is Mr. A. A. Sherwood's 2-mm. scale, $\frac{3}{8}$-in. gauge steam locomotive which was included in this section simply because there was no other section in which to put it! Really, it stands in a class by itself. I will not describe this little engine in detail, as I prefer that Mr. Sherwood should do that himself; but there is one feature about the engine which is worth emphasising, and it is that the engine clears a scale reduction of the *British* loading-gauge.

The problem of how to judge this most interesting little exhibit was solved by regarding such a job as being in a class by itself; it deserved some recognition, partly because of the ingenuity and even daring, put into its construction, and partly because of its novelty. A special " V.H.C." was thought to be appropriate.

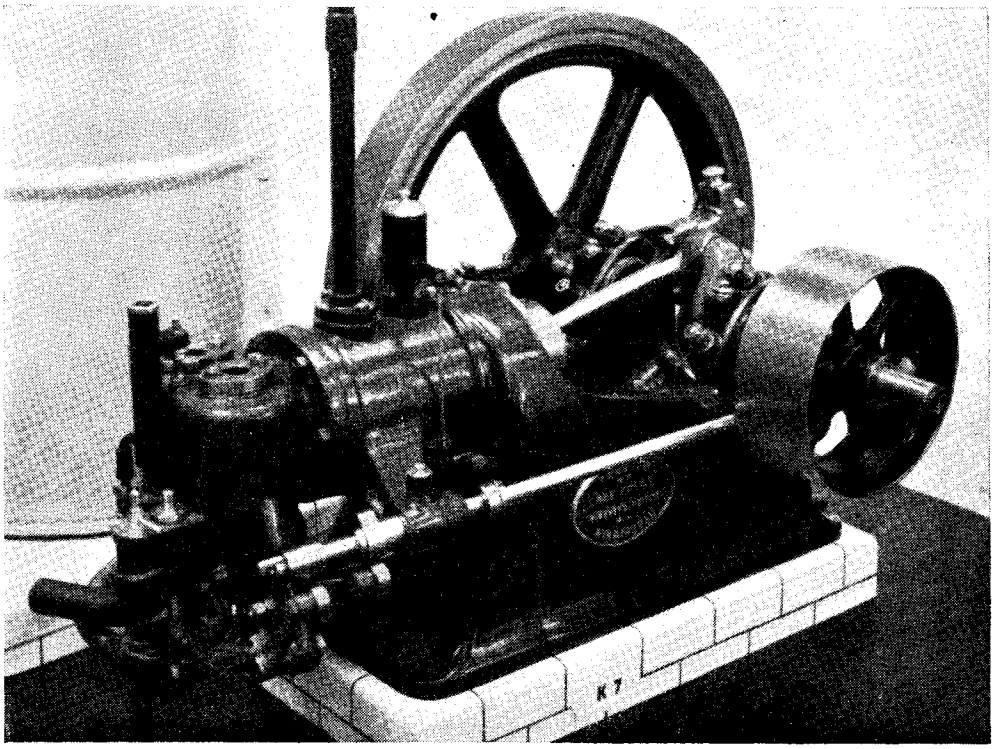
Generally, the locomotive section of the 1951 MODEL ENGINEER Exhibition cannot be placed among the most memorable of recent years; neither could it be regarded as mediocre. There is one comment which I will add to what I have already written; unpainted locomotives, no matter how beautifully they may be polished, cannot be judged as either *finished* exhibits or representative of their prototypes when compared with the other entries. For this reason, such entries are bound to lose points under the headings of fidelity and workmanship.

*Internal Combustion Engines

at the "M.E." Exhibition

IN the early days of model racing car development, there were good grounds for the hope that this type of model would bring forth some interesting departures in the design of small i.c. engines ; but despite the popularity of these models, originality in this respect has not come up to expectations. Only six self-propelled model racing cars were entered in this year's exhibition, and most of these were fitted with commercially-produced engines, with no outstanding features in other parts of the power plant installation or transmission system. The one noteworthy exhibit in this section was the free-lance Grand Prix racing car by Mr. C. E. Field, whose work has featured in previous exhibitions, and can always be depended upon to provide a welcome change from convention. As in some previous examples, this car was fitted with an o.h.v. four-stroke engine, both the design and workmanship of which were of a high order. A concession to the popular trend of model racing car design was the use of spur gear transmission.

Among the mechanically-propelled road vehicles, there were two examples of working i.c. engines, one of which, fitted to the Stevens motor-cycle combination by Mr. G. F. Wills, had the unique distinction of being a true scale working model, which is extremely rare in i.c. engines of so small a size. This engine was seen working on the demonstration stand, and gave a characteristic performance, answering perfectly to its controls, which included throttle and clutch, both operated by Bowden cables in the usual way, and also the foot-operated gear change. The kick-starter, quite understandably, was not used to start the engine, this function being effected by an ingenious hand gearing which could be engaged with the engine shaft on the near side. A full



Messrs. Kent & Tapper's magnificent scale model of an early Tangye gas engine. (*See September 20th issue*)

*Continued from page 377, "M.E.," September 20, 1951.

description of this model appeared in the issue of THE MODEL ENGINEER, dated December 14th, 1950.

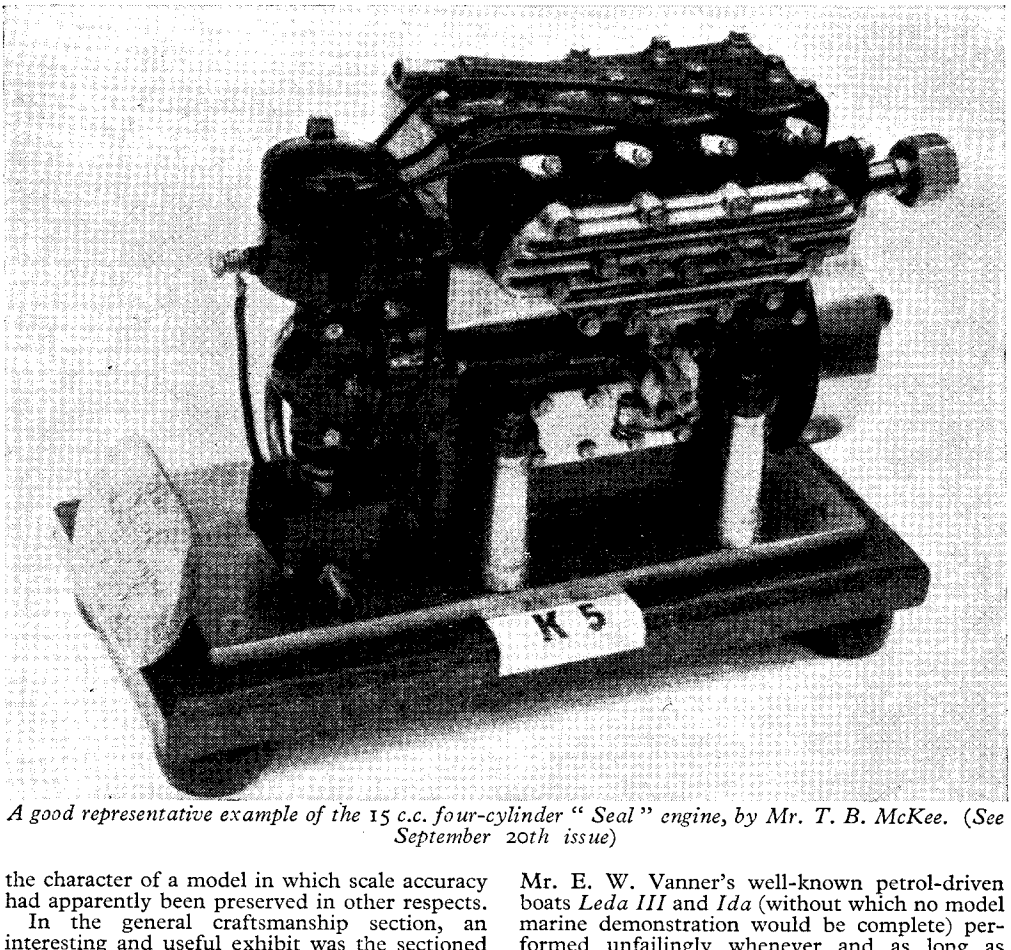
The other engine in this section was that fitted to the Sunbeam-Talbot chassis by Mr. K. H. Pritchard. This was an example of the well-known "Kestrel" 5 c.c. two-stroke, and although quite well made, and presumably capable of propelling the chassis at something well above scale speed, was out of keeping with the character of a model in which scale accuracy had apparently been preserved in other respects.

In the general craftsmanship section, an interesting and useful exhibit was the sectioned wooden model of a Matchless motor-cycle engine by Mr. J. G. Lee. The term "working model" applied to this exhibit was somewhat misleading; it was true only in so far as concerned the mechanical motions of the working parts, and it should properly have been termed a "sectional demonstration model." Incidentally, it refuted the popular conception of a model as something made to a smaller scale than the original, as it was apparently larger than the actual engine from which it was copied. The workmanship was very good, and details much better executed than is usual in wooden models. As an aid to technical education, the construction and subsequent use of models such as this one deserves much more attention in school workshops than it has hitherto received.

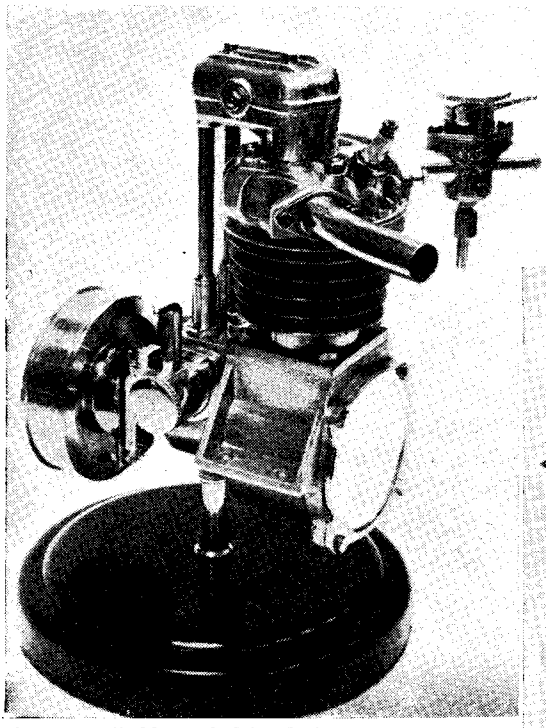
Marine Demonstrations

Other amateur-constructed i.c. engines at the exhibition included several examples of marine plants in the boats exhibited by the Model Power Boat Association, some of which took part in demonstrations on the Marine Tank. Mr. E. W. Vanner's well-known petrol-driven boats *Leda III* and *Ida* (without which no model marine demonstration would be complete) performed unfailingly whenever and as long as called upon to do so. Two very interesting new boats, exhibiting modern tendencies in the development of multi-cylinder engines, were Mr. R. H. R. Curwen's radio-controlled boat, with its 15 c.c. "Seal" engine and transmission by centrifugal clutch, and Mr. J. B. Skingley's launch *Josephine*, with its 30 c.c. "Seal Major" engine.

The M.P.B.A. stand also featured some interesting examples of racing craft and engines, including Mr. G. Stone's *Lady Babs II*, which holds many records in the "C" class (Restricted) and Mr. R. Phillip's *Foz II*, which is also one of the fastest boats in existence, and has done a



A good representative example of the 15 c.c. four-cylinder "Seal" engine, by Mr. T. B. McKee. (See September 20th issue)



A 10 c.c. "Channel Island Special" by Mr. T. W. Pedler. (See September 20th issue)

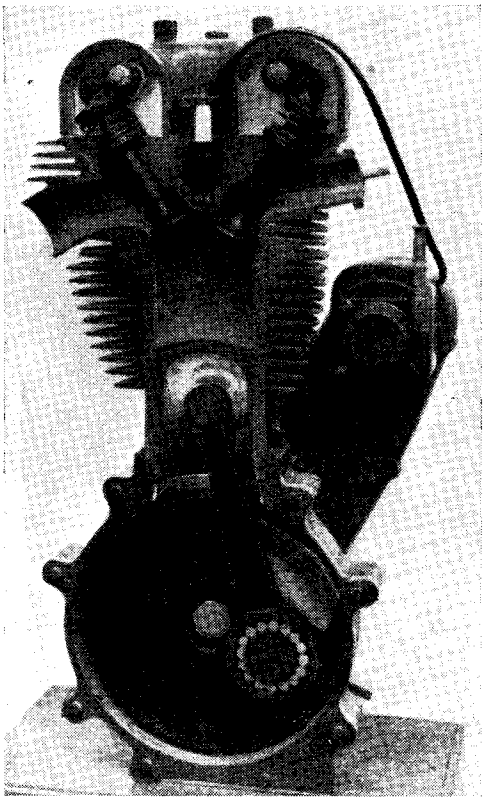
great deal to uphold the prestige of the amateur-built racing engine, both in this country and abroad.

A small, but by no means insignificant exhibit on this stand was the 2½ c.c. "split-single" two-stroke engine of Mr. Newton's boat *Slipstream*, which was shown in a dismantled condition. This typifies a class of engine which is at present attracting a good deal of attention among model power boat enthusiasts, who are noted for their pioneering spirit and have done more to foster promising new developments in power plant design than any other section of the model engineering fraternity.

Trade Section

Taken as a whole, the i.c. engines in this section were not of outstanding interest. Only one actual manufacturer of engines was represented and all engines on this stand were of the c.i. or glow-plug types, no outstanding improvements or innovations in design being in evidence. So far as can be ascertained from careful examnation of such engines as are at present produced in this country, it would appear that design has become practically static, and that such improvements as have been made in recent years have been due mainly to research in details of production methods, and composition of special fuels, than anything else.

The trade firms are doing very little at present to assist the constructors of i.c. engines, although other types of models, and steam locomotives in particular, are well catered for in this respect. Before the war, there were about a dozen firms supplying castings and parts for marine and aircraft petrol engines of various types, from 2 to 30 c.c., and stationary engines up to larger sizes. Only two firms displayed products in this class at this year's exhibition, namely: Stuart Turner Ltd., with their well-established 30 c.c. two-stroke and four-stroke marine engines, and the "Sandhurst" stationary engine;



The wooden demonstration model of a Matchless o.h.v. motor-cycle engine by Mr. J. G. Lee

and Craftsmanship Models Ltd., whose showcase contained a wide variety of castings for engines of popular designs which have been described in THE MODEL ENGINEER. The "Busy Bee" engine castings and parts by Braid Bros. are not quite in the same category as those mentioned above, but they were the centre of considerable interest, and there is every reason to believe that the construction of engines for utility purposes is likely to have a very strong appeal to model engineers in the future.

A Consistent Worker

A great deal of interest was displayed in the horizontal gas-petrol engine which was shown

(*Continued on page* 449)

NOTES ON NUTS

by A. D. Stubbs

WHEN I asked my typist for a suggestion as a name for this article, I expected her to be flippant and put forward "Nuts on Notes." Her suggestion is "Tips on Taps," which goes to show that her technical education has now developed to the extent that she knows a tap when she meets one.

It all started when I called on a young friend, and found him screwing a bolt in his lathe, and I hope that these notes will be useful to other beginners.

Some handbooks quote the ¼ in. B.S.W. thread reduction in diameter as 0.064, or 0.032 from *A* to *D*, and this is misleading, because the turned depth is only four-sixths of that or, if you use a sharp-pointed tool, five-sixths, when you will have a bolt thread as in the angle over the word "bolt" in Fig. 1. Provided that you radius or reduce the top of the threads to the *B* diameter, you will then get a Fig. 1 fit, and the bottom of thread space will only matter to the extent that you will have unnecessarily weakened the bolt.

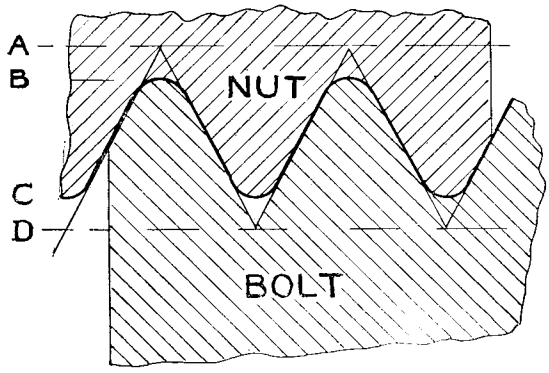


Fig. 1

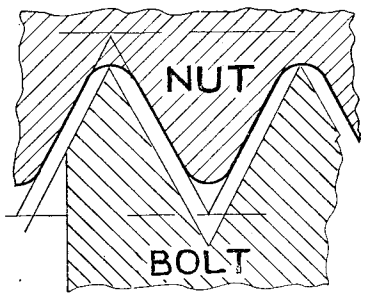


Fig. 2

He was feeding a single-point screwcutting tool in at 90 deg. to the lathe centre-line, using a micrometer as gauge, to produce a ¼ in. B.S.W. thread. The tops of the threads were sharp V's, and as the mic. said 0.025 he tried a factory-made nut, which just wouldn't look at it.

His workshop was cold, and I knew that it was tea-time, so I suggested we did the job on paper by the fireside, and that is where my sketches originated. They apply to all B.S.W., B.S.F., B.A. and B.S.P. threads and, to a modified extent, to the square-bottomed metric threads.

A thread formation is admittedly based on a V angle, 55 deg. in the case of British Standard Whitworth, but the nominal size diameter is not measured from apex to apex. Fig. 1 shows the formation, with *A* and *D* as the top and bottom of the V angles, but the B.S.W. dimension is *B*, for the bolt, and the distance from *A* to *B* is one-sixth the total distance from *A* to *D*.

If, therefore, a piece of bar larger than the finished screwing is screwed with a vee tool until the *A* diameter is 0.025 in., it would (given a thou. or so clearance on the radius) position on a perfect nut as in Fig. 2.

You will see that the only points of contact are on the apexes of the V's. One good twist with a spanner and thereafter the nut will flop about in a shocking way.

Incidentally, Fig. 2 indicates how, if yet another cut is taken to lower the tops of the threads below *B*, to prevent them contacting the nut, the bottom of threads on the bolt will have eaten considerably into the metal strength of the bolt.

Now what about that 55 deg. angle? I have encountered otherwise quite good commercial engineering workshops which still permit their machinists to grind tools by eye. Admittedly, a turner with umpteen years of experience doesn't get far from his 55, but that is not engineering as I was taught it.

In Fig. 3, I show one-and-a-half-threads with a bolt cut by a tool ground to produce 53 deg., and one thread cut to produce 57 deg. You see that a 53 angle gives nut contact about the *B* diameter, is slack throughout the rest of the thread, and although not initially as atrocious as Fig. 2, it will soon get into that condition.

The right-hand, 57 deg., effort, just contacts on the *C* diameter and is equally a poor show, yet with just that little extra care all might have been Fig. 1 finish. I know that Fig. 1 should show a fit clearance, but for the purpose of this article it suffices.

Do you ever break taps? I do, but mine keep my chaser department stocked. Of course, the perfect answer to screwing with a single-point V-cutting tool is to finish off with a chaser, but

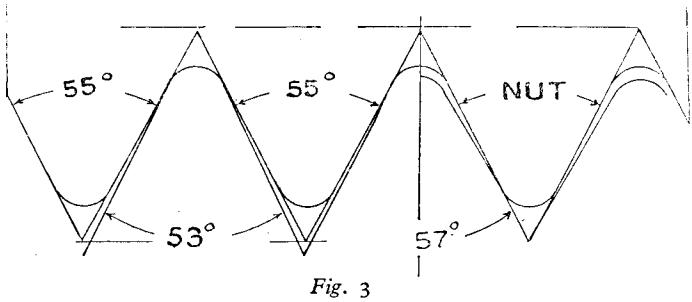


Fig. 3

if you cater for a fairly comprehensive range of even but one standard screwing, you will want a couple of dozen (inside and outside), and if you use three or four standards this hobby becomes expensive.

Fig. 4 shows a broken tap, with flats ground on the shank. In the position shown, when set up in the lathe, it becomes an external chaser. Grind away three of the lands and you have an internal chaser.

At times the shank will get in your way. Break the tap, or grind it through, at the top of the flutes, grind off two opposing lands, and you

Fig. 4

have a short external chaser that will do its job right up to a fairly large shoulder.

And just one sympathetic thought for me from you beginners, please, because I'm going to get a lot of letters asking me whether I use left-handed taps, others passing sarcastic remarks about the following edge of a land, or dissertations on cutting angles. I can take it, but if you try out the broken tap idea you will find that you can produce your threads *B* to *C*, Fig. 1, every time.

Or can you? My young friend was feeding his tool in at 90 deg. (see Fig. 5). Now, when a V tool goes straight in and is nearly home, the cut is the sum of the two sides of the angle. Work that one out, comparing it with a parting tool, and you will know why you are having trouble.

Bring the topslide round, so that it feeds on a 27½ deg. angle, as Fig. 5. Hold the tool at 90 deg. to the lathe, then feed in with the cross-slide for your first cut, but for the second and subsequent cuts feed with your topslide screw.

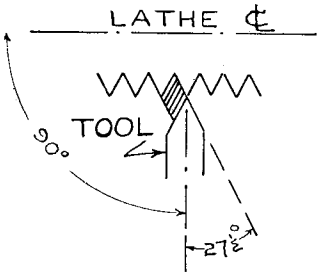


Fig. 5

This advances the tool down my series of feed lines, and the width of the cut never exceeds one side of the angle.

Just one word on screwing to a factory-made nut as a gauge. Nuts so mass-produced cannot be all accurate, some will be tight, some slack, and a few will have no threads at all! Try them with a tap first, that broken one will do.

INTERNAL COMBUSTION ENGINES AT THE "M.E." EXHIBITION

(*Continued from page* 447)

working on the "M.E." workshop stand. As this engine is to be fully described in later issues, it is not necessary to say a great deal about it here, but it may be mentioned that the main object in this demonstration was to revive interest in an almost forgotten type of engine which is relatively straightforward to build, quiet-running and flexible, and quite capable of earning its keep by performing duties such as driving a small charging set, or even a lathe. To many of the younger generation, who possibly had never encountered industrial gas or petrol engines which were popular about half a century ago, the performance of this engine was a startling surprise, entirely at variance with modern ideas about the behaviour of small i.c. engines.

The Grand Prix Motor Car Racing Track

Strictly speaking, this feature may be regarded as somewhat outside the scope of this review, as it will probably be the subject of a separate article; but it may be permissible to record the impression that this is the cleverest thing that has been done in model car racing up to the present. Powered by 0.75 c.c. engines, with centrifugal clutches which allowed them to be held at the starting line with engines running, and released simultaneously at the starting signal, the neck-and-neck race of three equally-matched cars over a tortuous course, at a scale speed of some 150 m.p.h., provided a thrilling spectacle, which even expert observers of full-size car-racing could not fail to appreciate.

"L.B.S.C's" Lobby Chat

A Touch of Realism

MR. GROSE came along to my little railway, after a very long absence, on a recent Saturday morning, and brought his camera as well as his G.W.R. 4-6-0 locomotive. The results of his handiwork are shown in the accompanying pictures. Mr. J. N. Maskelyne once remarked that if you wanted to see if an engine looked like the full-sized article, take a photograph of it, from an appropriate viewpoint. He never spoke a truer word! Although I built *Grosvenor* and, incidentally, never used a single pencilled line, as I knew every nut and bolt in her full-sized sister, I didn't realise until I saw the photographs, that she was so true to life. I really must try to make a desperate effort to paint and line her, and put her name on the splashers; a job I can manage if only time would permit. She also needs a set of route indication boards, and three lamps, and a weeny pail, which I hope to provide her with, just for the sake of sentiment. She is a picture to watch in action; apart from a faint purr from the chimney, she is as quiet as *Jeanie Deans*, and the only evidence of motion is the big balance-weight in the driving wheel, bobbing around from under the splasher.

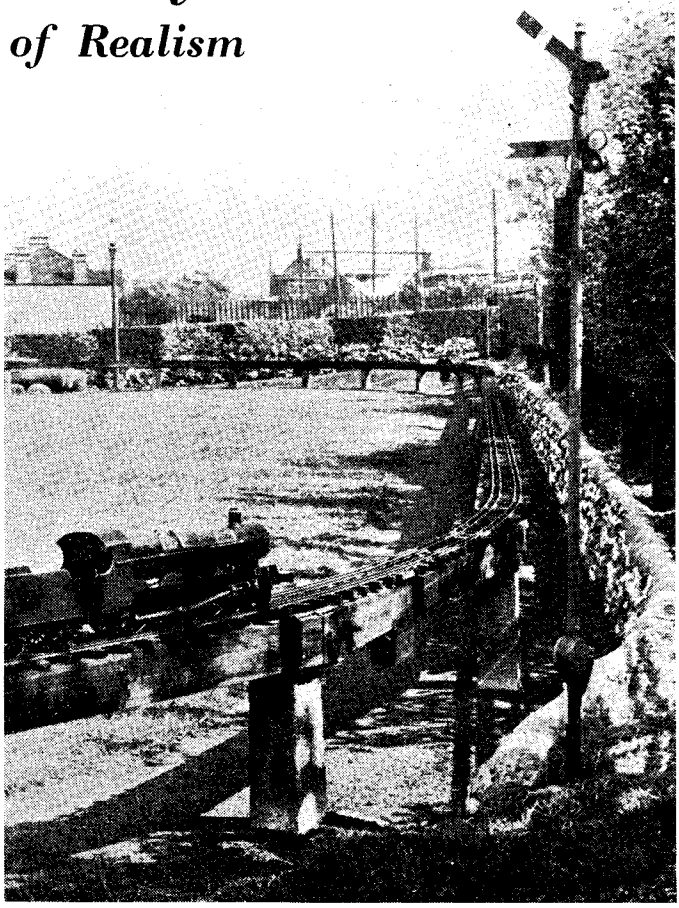


Photo by] [*C. J. Grose*

"*Distant on!*"

Several readers have called attention to the fact that although my full-sized L.B. & S.C. Railway signal has been shown in a photograph, no pictures of the smaller ones have ever appeared in this journal; so I got friend Grose to take a shot of the east side straight line, which gives a close-up of the small stop signal with the controlled distant arm underneath it. The working of this was explained, together with a wiring diagram, some time ago. The locomotive shown in the picture is Mr. Grose's *Saint*, and she has a clear road as far as the three-aspect colour-light signal, which can just be discerned at the far end of the retaining wall. Just beyond this, exactly above the relay box under the longitudinal timbers carrying the line, can be seen the short driving car; the aluminium "clothes-preservers" can be plainly seen on it. As it is in the section protected by the colour-light signal, same is showing a red aspect; the distant arm underneath the stop signal is therefore at "caution" and also showing a yellow light, as there is no separate lamp switch, and the signals are always lit up, same as the colour-lights. The driver of the G.W.R. engine has taken due warning, shut off steam, and will stop at the colour-light if the obstructing car isn't shunted out of the way—incidentally, it was, by the simple expedient of lifting it off the line, which definitely *isn't* full-size practice!! The construction of the signal has already been detailed; the boxes on the post contain the solenoids, and the wires from the junction box at the bottom, go underground to the concrete post, up the side of it, and under the wooden girder to the relay box opposite the signal. Our local S.R. station can be seen above the railings in the background.

Blaming the Wrong Party

In the stories of that great detective of fiction, Sherlock Holmes, written by Sir A. Conan

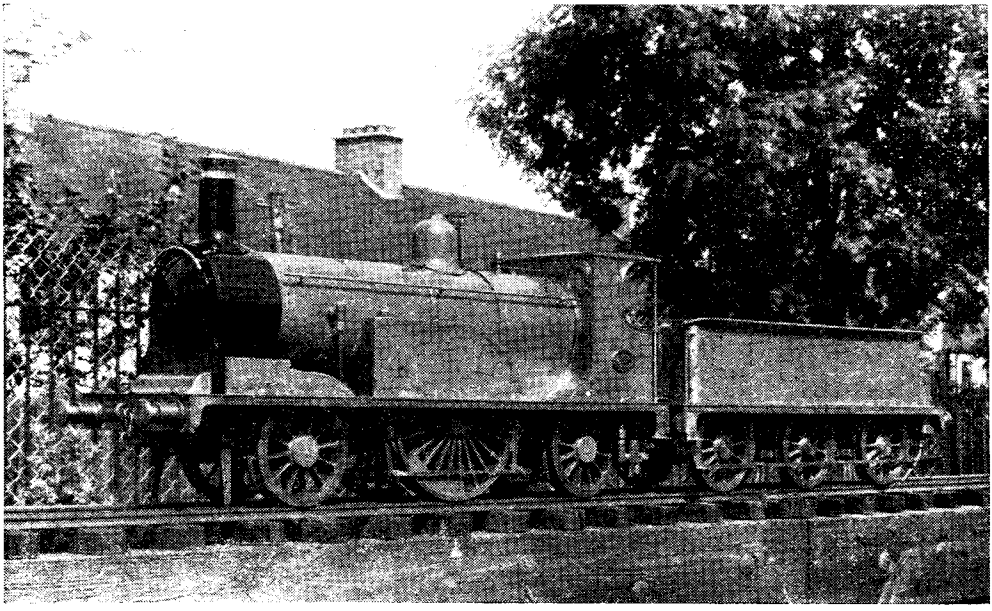


Photo by] *A vision of the past* [*C. J. Grose*

Doyle over half-a-century ago, it was always amusing to read how the equally fictitious Inspector Lestrade, of Scotland Yard, invariably attributed the crime to the wrong person, and chased him or her until finally Sherlock took the matter in hand, and eventually unearthed the real culprit. Sherlock, by the way, never failed to explain matters in full, to his friend Dr. Watson. As is often the case, similar things occur in real life, and an innocent person gets the blame for somebone else's sins of omission or commission, whilst even inanimate objects are not immune. The following is a case in point, and I record it in the hope that it may save others

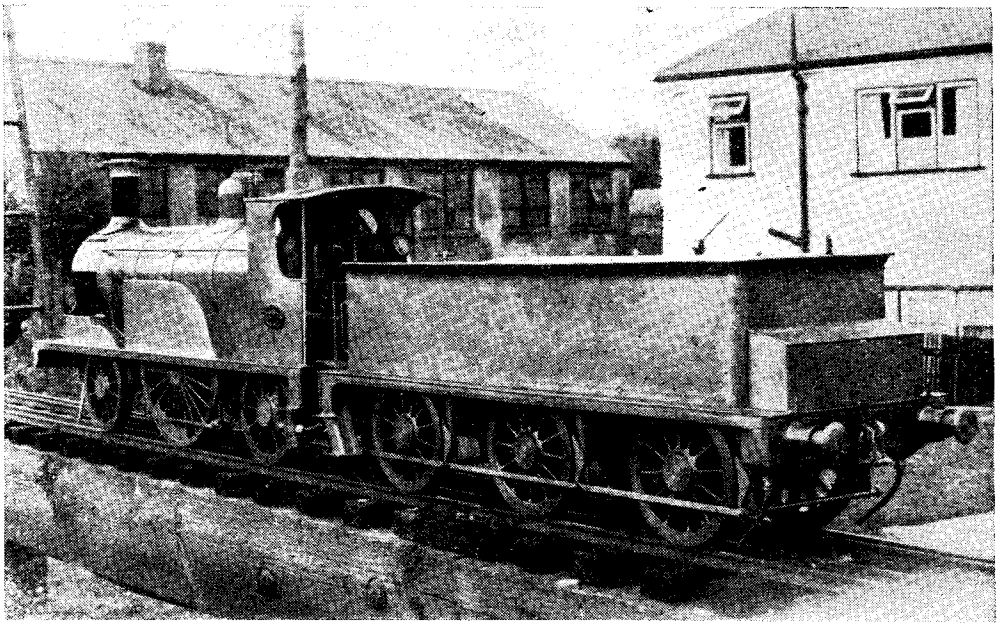


Photo by] *Note the Stroudley characteristics* [*C. J. Grose*

from wasting valuable time in " chasing moonbeams," in a manner of speaking.

I received a letter from a friend whom I had not seen for some years, as he had removed to a provincial town ; and in it he wrote—I quote from memory, as near as I can recollect—" the old engine is still going as well as ever, bar one thing which has me properly puzzled. Do you recollect fixing that injector for me ; you put a new set of cones in it, and it worked fine until a little while ago, when it suddenly went on strike. I thought it wanted cleaning, so took it off and carefully cleaned the cones according to instructions, also the air-releasing ball and the seating ; but on replacing on the engine, it still refused to feed at working pressure, blowing steam and hot water from the overflow. The funny part is that at about 40 lb. it starts right away, and works quite dry ; but at a little above that, it splutters and knocks off. Can you suggest any cause ? "

Long-range Diagnosis

As I have explained in various dissertations on injectors, the general rule for determining the working pressure is that for low pressures, the steam cone has to be fairly large in the throat, and the annular space around the nozzle, where it enters the combining cone, does not need to be very large to pass the amount of water needed to condense the steam. As the pressure increases, the bore of the throat is diminished, and the annular space increased, either by not letting the nozzle enter so far, or by making it of smaller diameter. If there is too much steam, and insufficient water, the steam won't be condensed, and the mixture of steam and hot water will be blown out of the overflow. Naturally the first thing that came to my mind was that Andy (I'll call my friend by that name because it isn't his baptismal moniker) had managed to enlarge the steam cone whilst cleaning it. As the annular water space was, of course, " as-you-were," it appeared that too much steam was now passing, so I wrote and told him so. Andy promptly reassured me on that point ; he said a 63 drill went through easily, but a 62 wouldn't. He had also checked the other cones, and found that the combining cone passed a 70 but not a 69, and the delivery 75 and not 74. The airball seating, examined under a magnifying glass, appeared perfect. In fact, the injector was, to all appearances, exactly as I had returned it to him, and in the same state in which it worked perfectly, trouble free, for years.

Other Likely Causes

In my next letter I suggested to Andy that he should look elsewhere for some fault which might have developed ; was the delivery pipe to the boiler furred up, the clack leaking, or some obstruction in either ? How about the water valve and pipe ? Something might be partially blocking the strainer in the tender, or there might be a squeezed-up place in the pipe (the engine had suffered one or two derailments through weather effects on his railway) and the rubber hose connection might be perished, cracked, and drawing air. Incidentally, this is a common cause of injector failures. Even if a rubber hose connection is in good condition, the end which slips over the feed pipe on the engine sometimes becomes enlarged through the rubber permanently stretching, and air is drawn in between the hose and the end of the feed pipe. Obviously, there was nothing the matter with the steam supply, as steam was blowing from the overflow. Anyway, I told Andy that if everything appeared to be in order, and the injector persisted in its non-feeding antics, the best thing to do, would be to take it off and send it along to me, and I would give it a lesson in good manners.

The next incident in the story was the arrival of the " suspect " itself, with a covering letter from Andy. He had found the delivery pipe dirty, so had promptly replaced it with a fresh piece of tube. Feed pipe, valve, and strainer all totally exonerated from blame, and discharged without a stain on their characters. Still no feed from the injector at over 40 lb. though below that, it was all that could be desired. That was what puzzled him ; and it began to puzzle your humble servant, too, when I checked off the blessed gadget, and found everything exactly as Andy had stated. I poked my drills through the cone throats, and found them correct to size ; my reamers fitted the tapers exactly ; my gauges fitted between the cones without any shake, and the steam cone entered the combining cone the exact distance that it should. Both clack and airball were in perfect order, with no leakage. What on earth *could* be the trouble ? Well, thought I, let's try the jigger on a locomotive, and see what happens when the pressure rises above 40 lb.

The Mystery Deepens !

All my injectors are specified to have standard connections, so that it is an easy matter, just a couple of minutes' work, to put a " foreigner " on one of my own engines for a test. Old *Ayesha* is usually the " guinea-pig," so I took off her own injector, and replaced it by the Chinese puzzle ; took her out to the little railway, and got up steam. *Ayesha* blows off at about 85 lb. She had half-a-glass of water, so as soon as the safety-valve lifted, I opened the water valve, noted that the dribble from the overflow was correct, and smacked the steam valve wide open. Then I nearly fainted ; believe it or not, that darned injector just went siss—phut ! and the overflow dried up, it started instantly to feed, and chirruped away as if it were laughing at my astonishment. I recovered my senses in time to prevent the water going above the top nut and getting down the blower pipe ; and as soon as I shut off the steam and water, *Ayesha's* safety-valve lifted again.

I boarded the flat car—which, by the way, is a dinky little short one, just long enough to provide a comfortable seat ; my weight is evenly distributed over the two bogies. It has two aluminium valances which prevent the sleepers tearing my clothes, and a cross handle at each end, very handy for steadying purposes when taking curves at a tidy lick, or firing on the run. The bogies swivel on ball-bearings, and one wheel of each pair is loose on the axle, so that there is no slipping of the wheels on the rails when going around curves. The difference in length between inner and outer rails is compensated by the wheel

slipping on the axle, just like an ordinary plain bearing. This not only saves friction, but minimises the wear on the rail heads, as both wheels roll only ; if they are both fixed to the axle, you get a combination of roll and slip, which gives the rail head " socks " on sharp curves. One bogie has brake blocks on all four wheels, and the car has a lap counter. You can see this car in the distance, on the picture showing part of my railway. Well, to return to our watery narrative, I opened the regulator, and off went old *Ayesha* in her usual lively style, with the firehole door open, to prevent excessive blowing off. As soon as the water level dropped once more to half-a-glass, I shut the firehole door, and opened the injector steam and water valves again. Same thing happened—siss—phut! and it picked up instantly, not even needing any water regulation. I shut it off just below top-nut level, and opened the firehole door again, as the boiler started to blow off. This antic was repeated until the water in the tender was all used up ; the injector never gave the least trouble, and I thought, " Well, Andy, old china, what do you know about that ? "

Curlylock Holmes on the Trail

I took the injector off *Ayesha* and returned it to Andy, with a covering letter telling him of the test, and pointing out that obviously it couldn't be anything in the injector itself. I took his word that his valves and pipes were O.K. and I knew he wasn't leg-pulling ; we both love a joke, but we don't indulge in any " silly-kid " antics for the purpose of wasting valuable time. In a final effort to solve the mystery, I suggested that he should ascertain if the hand-pump clack was leaking ; or the top clack on the boiler, which takes the feed from the eccentric-driven pump, was not seating properly, and allowing steam to blow back into the tender via the bypass pipe. Either defect would cause the water in the tender to warm up and prevent the injector working at normal pressure. I also asked if he had made any repairs or adjustments to the engine, just before the injector went all haywire ; and if so, what exactly they were ?

Andy's next letter said he was completely and absolutely flummoxed. He had checked off both feed clacks right away, and to make assurance doubly sure, had both of them down and reseated them. The water in the tender was stone cold. He then re-erected the injector, got up steam, the results were exactly the same, no feed above 40 lb. and somebody must have put a hoodoo on him, or his engine, or both of them. As to my final query, the only thing he had done recently, was to renew the safety-valve springs. They started blowing off at lower than working pressure, and he had gradually screwed down the nipples to the end of the thread. When she still blew off at low pressure, he put in a new pair of springs, *and set them to blow off at a shade over* 80 *lb., as indicated by the " clock " in the cab.* In passing, enginemen usually call the gauges " clocks."

The last sentence stirred the grey matter that operated pretty efficiently under a great mass of golden curls well over half-a-century ago, and still manages to function in a nearly-worn-out housing. The safety-valve springs got weaker and weaker—aha ! Now, how did he know ? By the indication shown on the pressure gauge. How did he adjust his new springs ? By the pressure shown on the gauge. Well, thought Curlylock Holmes, supposing that gauge was a bit of an Ananias, and by virtue of age, overstraining, or some other causes, had departed from the paths of virtue ? The normal range of an injector with the cones of the sizes mentioned above is from about 95 lb. down to almost nothing. If the pressure rises above the higher range point, too much steam passes through the steam cone, the water is unable to condense it, and steam and hot water blows from the overflow pipe ; exactly the trouble that Andy was experiencing.

The Culprit Unmasked

I wrote Andy that I believed the problem was solved ; would he please take off the steam gauge and send it so that I could check off the registered pressures against my full-sized locomotive steam gauge. The little gauge duly arrived ; I coupled it up to one of the unions on my little brass air tank, which I use for testing and setting safety-valves, checking small pressure-gauges, and similar jobs. The full-sized gauge was attached alongside it, and the pump started. Both gauge fingers started from scratch all right, and it was a neck-and-neck race up to 30 lb. and then the big gauge began to forge ahead. When the little gauge registered 40 lb. the big one was up to 50, and then it went ahead by leaps and bounds, until finally, when the little gauge needle was on the 80 mark, its big relation was registering no less than 135 lb. ! ! The culprit was well and truly caught.

I let the pressure down to 80 lb., and made a mark on the dial of the little gauge, at the place where the needle had come to rest. I then returned the gauge to Andy, told him of the test, and advised him to get a new steam gauge altogether ; meanwhile, replace the old one temporarily, and set his safety-valves to blow off when the needle pointed to the mark I had made on the dial. Then steam up the engine, and try the injector. This was done ; and a few days after I received a letter saying that the injector now worked perfectly, not the slightest trouble, either running or standing. Andy naively added, that now he came to think of it, he had noticed that the engine had developed an extra loud bark, and would slip like the merry dickens if the regulator happened to be opened a wee bit too quickly. This was hardly surprising in view of the boiler carrying 55 lb. above its normal working pressure ! It is a good job that I design my boilers to stand a big overload in perfect safety, and that builders of the locomotives faithfully carry out my instructions ; otherwise Andy would now be either playing a harp, or stoking up a bigger fire than ever he had in the firebox of his engine !

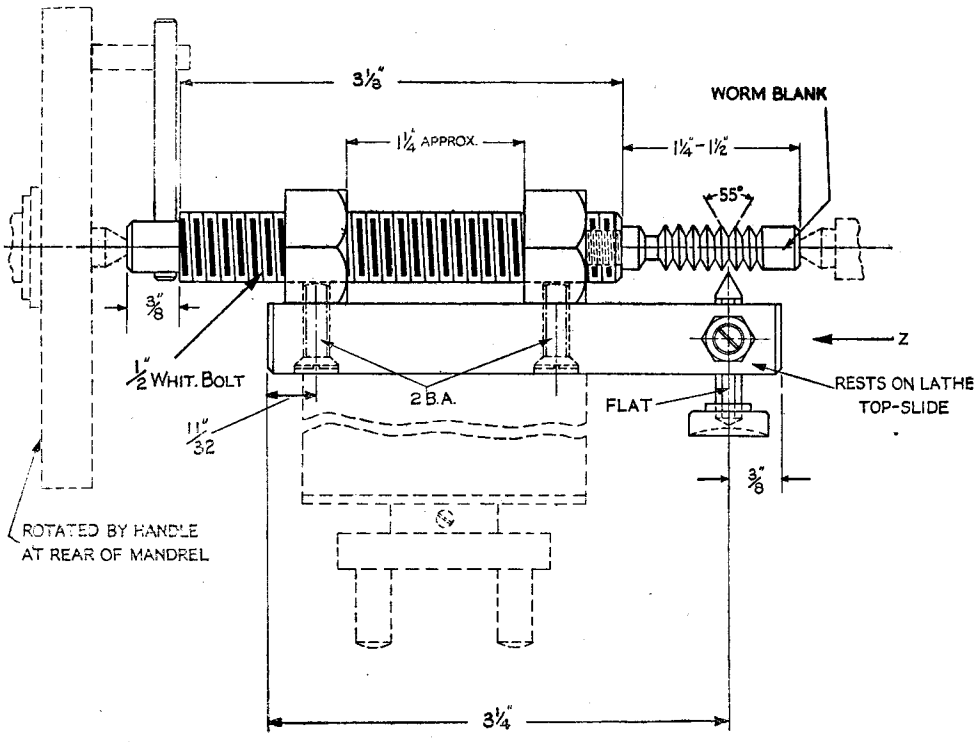
The above just goes to show how easily one can be misled, and how blame can be attached to an unfortunate piece of mechanism for failing to operate, when the actual cause of the failure doesn't lie in the gadget itself, but is due to some entirely independent cause. I don't dispute for one moment, that an injector is a tricky little merchant to make ; but at the same time, all that anyone has to do to achieve full success with

(*Continued on page* 455)

An Improved Screwcutting Device

by J. C. Stevens

THE following notes and sketches show a simple attachment recently made by the writer to enable a worm-wheel to be cut on his small non-screwcutting lathe.



Having embarked on the construction of the attractive electric clock described by Mr. C. R. Jones (THE MODEL ENGINEER, January 26th-February 23rd, 1950) it was found necessary to produce a worm $\frac{5}{16}$ in. dia. × 12 t.p.i., and being one of those curious individuals who regard outside assistance as tantamount to "cheating," this little gadget was made up and has proved successful.

A ½-in. Whitworth bolt 3½ in. in length, complete with two hexagon nuts, was discovered in the scrap-box, and when it was remembered that this size thread has the requisite 12 t.p.i. it was felt to have "possibilities."

The sketches are almost self-explanatory and show the two hexagon nuts bolted to the ½ in. × ⅜ in. mild-steel bar, each by a single 2 B.A. screw.

Drill and tap for one nut for a commencement, and then thread the second nut on the bolt at the approximate distance from the first, which is now firmly screwed to the bar, and mark position of second tapping hole with drill. (This is necessary to ensure that the second nut is in correct position to "pick-up" thread in relation to first nut.)

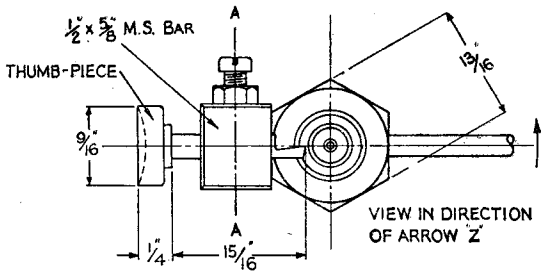
The cutting tool is a piece of $\frac{3}{16}$ in. round silver-steel with a flat filed on its top face to prevent it turning on its axis, and finally hardened and tempered to a medium straw colour. The 5/32 in. set-screw is adjusted to bear lightly on this flat, and then locked in position by means of the nut provided. The tool must be able to slide forward into cut by light pressure on the thumb-piece.

The worm blank—a piece of 11/32-in. silver-steel—was then annealed in a gas-flame, set to run truly in four-jaw chuck, turned down to ¼ in. dia. for a distance of ¼ in. and threaded ¼ in. × 40, care being taken to preserve a true shoulder. The opposite end was set to run equally truly and centred with a Slocombe drill.

The ½-in. bolt was now accurately chucked and centre-drilled at one end, and drilled and tapped ¼ in. × 40 at the other. A piece of 5/32-in. steel rod with a slight taper filed on one end was pressed into a transverse hole (No. 25 drill) in the bolt, thus forming a light

and efficient carrier, as shown in the drawing.

The worm blank was now tightly screwed into the end of the bolt, and the assembly set up between lathe centres, where it was found to run reasonably truly ; the blank was turned down to $\frac{5}{16}$ in. dia., and a groove turned as shown, to



provide a space to receive the threading tool at the end of its cut.

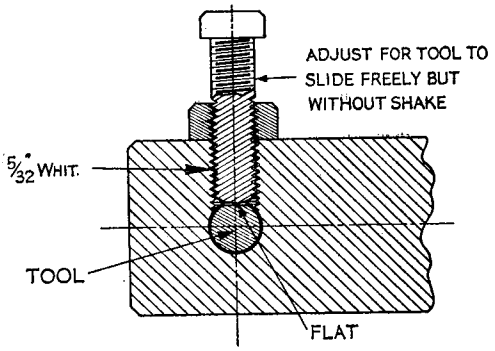
The steel bar carrying the hexagon nuts was now threaded on the bolt and a simple handle (previously made) fitted on the rear end of the mandrel to allow of hand-operation.

To use the device, the steel bar simply rests on the top-slide of the lathe, the handle is rotated in the normal direction and at the same time the cutter is pressed lightly into contact with the wheel blank by means of the thumb-piece, thus tracing the pitch of the ½-in. leadscrew on the $\frac{5}{16}$-in. silver-steel. With care and patience a presentable thread may be produced by succeeding " scrapes " along the blank.

The thumb-piece is merely a stub of brass turned to shape and drilled a press fit over the end of the cutter, and was found desirable from the point of view of comfort in operating the contrivance.

The first few " scrapes " proved the most difficult when first tried out ; the tool is inclined to dig-in and only the lightest scratch should be attempted at first. However, when the cut becomes a little deeper this tendency seems largely to disappear, and the cutting action becomes sweeter and easier altogether.

In conclusion, when cutting a worm, allow the first couple of turns at starting-point of cut



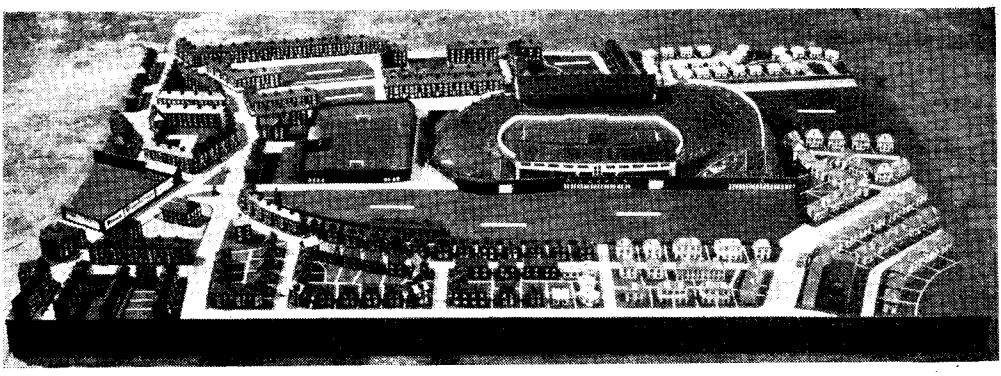
ENLARGED SECTION THROUGH 'AA'

as extra to finished length, as the tool requires a turn or so to engage to full depth. These, of course, are cut off when the job is completed.

" L.B.S.C.'s " Lobby Chat

(*Continued from page* 453)

it, is to follow my instructions. I've done all the experimenting ; you just profit by the result of my labours. If made as described, it will do the job, and keep on doing it, as long as the cones are kept clean, as in full-size practice. If an injector fails, then either it is *not* made to instructions, or the cause lies elsewhere, as in the instance I have related. Before leaving the subject, I would just like to point out one very important thing, viz. that while I can give instructions, I cannot guarantee what interpretation individual builders will put on them ; and it is that last point that makes all the difference between success and failure. A famous artist was once asked how to paint pictures ; his answer was that you get a piece of canvas, some paint, and a few brushes, and apply the paint to the canvas by means of the brushes. Perfectly true, and an excellent answer at that ; but if the paint is applied to the canvas by the same method used when whitewashing a ceiling or decorating the door of the garden shed, the result is not quite up to the standard of the artist. Same thing applies to locomotive building ; some of the injector cones I have seen, *supposed* to have been made to specification, are on a par with the whitewashing and door painting—and the makers are disgruntled because the results are not as expected. If any of the members of the Glasgow S.M.E. want confirmation as to how an injector *should* work, they have only to ask the two " brothers of the clan " who came south last August, and drove *Jeanie Deans* around my railway. *Jeanie* is a real Scots lassie, verra frugal wi' the coal and water, ye ken—she'll dae twa laps wi' the fire oot !



Hampden Park Football Ground in Miniature

by Constable H. Wilson

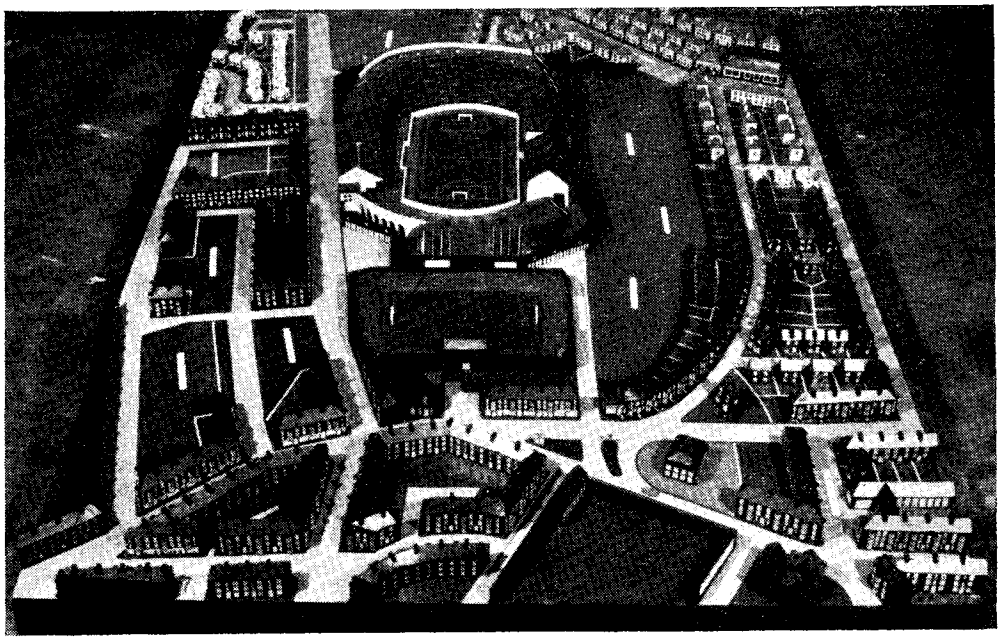
I WAS asked by our chief constable to construct a model of Hampden Park Football ground and the surrounding district, which could be used for instructional purposes by various members of the Glasgow Police Force, and I thought the reproduced photographs would be of interest to other readers.

The model is constructed of solid wooden houses and tenements with corrugated aluminium on the roofs of the stands and pre-fab houses. The terracing is built up with plywood and is backed by plaster to represent earth. All windows and doors were painted on and there are over 5,000 of them. The entrance gates to the park are all lettered or numbered and the terracing is also numbered to correspond with the actual numbering on the full-size site.

I worked to a scale of 127 in. = 1 mile, which was five times larger than the survey map I used to lay out the plan. All tenements, houses, garages, churches, telephone boxes, police signal boxes, car parks and entrances are put where they are in actual fact.

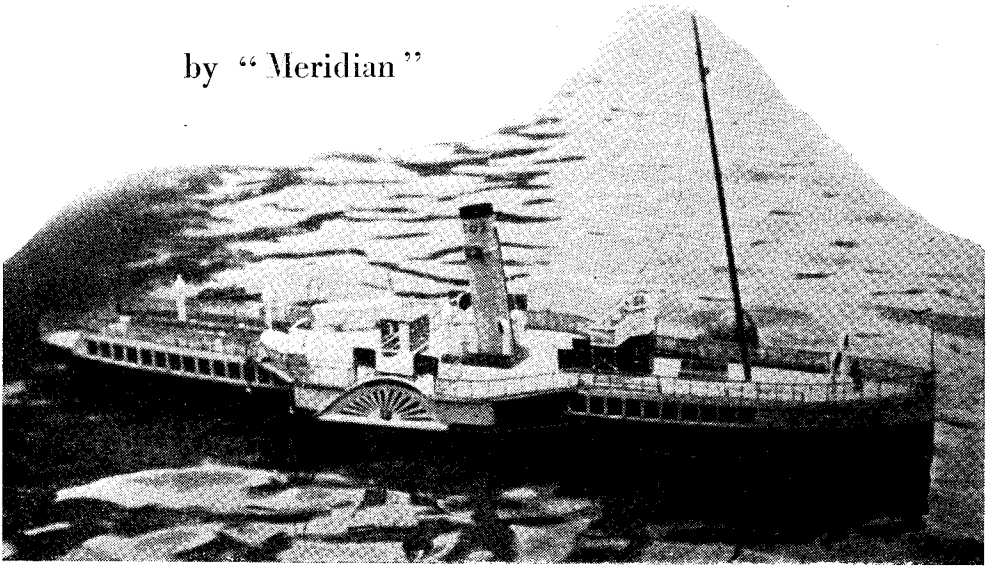
When roughly 140,000 people converge on one football park in one afternoon, it will be appreciated what value a model of this kind is to those who are responsible for the smooth running of traffic and the transport of enthusiasts to the game.

The photographs were taken by Detective Constable Charles Florence of our Identification Bureau.



MODEL POWER BOAT NEWS

by "Meridian"



A new radio-controlled paddle steamer by Mr. Starkey (Southend)

THE growing popularity of model power boats in recent years has been demonstrated in many ways, but none more clearly than in the entries for the various regattas.

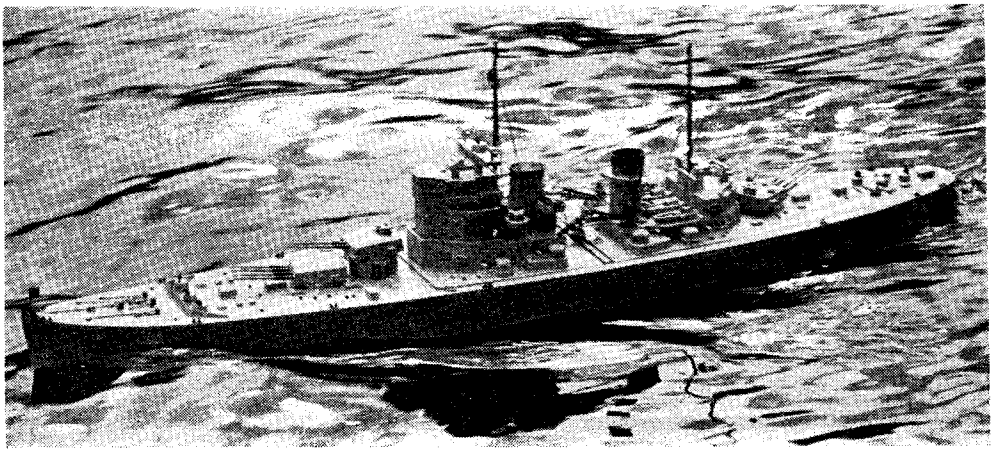
The Grand Regatta, in particular, seems to attract a larger entry each year, and in view of the record attendance in 1950, when over 120 different boats were entered, something had to be done to ensure the smooth running of the 1951 regatta.

The committee of the M.P.B.A. considered the problem, and made some special rules for this regatta which included: entries in advance, only one boat per event per member, and a time limit on the line in the speed events.

The entry this year was just as formidable as in 1950, and in fact was slightly greater in number. Thanks to the officials, who in all cases stuck to their jobs magnificently, the regatta went like clockwork, and ended with the prize-giving, which took place about 6.15 p.m.—quite a reasonable time.

The regatta was held, as usual, the day following the end of the "M.E." Exhibition, at Victoria Park, London E.7, and the announced starting time was 10.30 a.m.

The 75 yd. Nomination Race was item No. 1 on the programme, and thanks to the many



The model battleship "King George V" by Mr. H. Dowling (Southend)

competitors who arrived early, the Regatta was started exactly to time. Since nominations had already been given in, late-comers were able to join in on arrival. This year the winner was J. Thomas (Blackheath), with the petrol-driven launch *Rose*, which made a nice clean run down the lake, the time taken being only 0.3 sec. different from the estimated time (1.8 per cent. error). There were several new boats making a regatta appearance, and quite a few of the boats seen had been demonstrating in the Marine Tank at the MODEL ENGINEER Exhibition during the previous fortnight.

The spectators, who were already lining the pondside, had an opportunity of seeing all types of prototype and steering boats in action, as boat after boat covered the 75 yd. course. The place winners in this event were Messrs. Brown (Victoria) and Curtis (Kingsmere), both of whom had errors of less than one second.

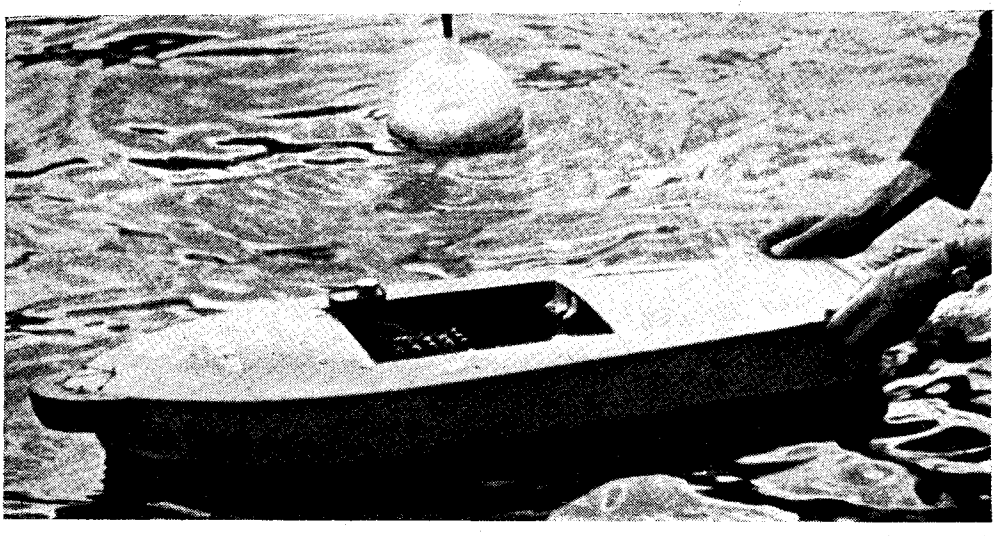
As the last of the competitors were running in the Nomination Race, the stewards had been gathering the competitors for the " C " Restricted Race for the E.D. Trophy, and there were 13 entries for this event, the distance being 500 yd. During this race the time limit had only to be applied once, although time limits do tend to make competitors rather nervous. G. Stone (Kingsmere), running *Rodney* in this race, could not finish the course owing to the knock-off switch falling down, but *Rodney* seems to have plenty of speed when she *is* running. Very few of the boats seemed to be able to produce their best performances. A notable exception was L. Pinder's *Rednip* 8, which was the winner of the race at 62.9 m.p.h. This speed was recorded on the first run, but as one of the sponsons was damaged, a second run could not be taken. The holder of the E.D. Trophy, S. W. Poyser (Victoria) could do no better than 42 m.p.h. in the race, although much higher speeds have been made during recent test runs. Second place was taken by C. Stanworth (Sen.) with *May* (Bournville) at 43.7 m.p.h.

Immediately following came the Class " B " boats in the 500 yd. Race for the Mears Trophy, and again there was quite a good entry. Unfortunately, there were several capsizes during this race, and among the unlucky ones was R. Michell's *Beta II* (Runcorn) which, after a nasty dive on the first run, could not be started when the second run came round. W. Churcher (Coventry) had capsizes on two attempts, while T. Dalziel (Bournville) with *Naiad* 2 suffered engine trouble during the first run, and the damage was sufficient to prevent another attempt being made. The winner was G. Lines (Orpington), with *Sparky* 2, at the very good speed of 55.9 m.p.h.

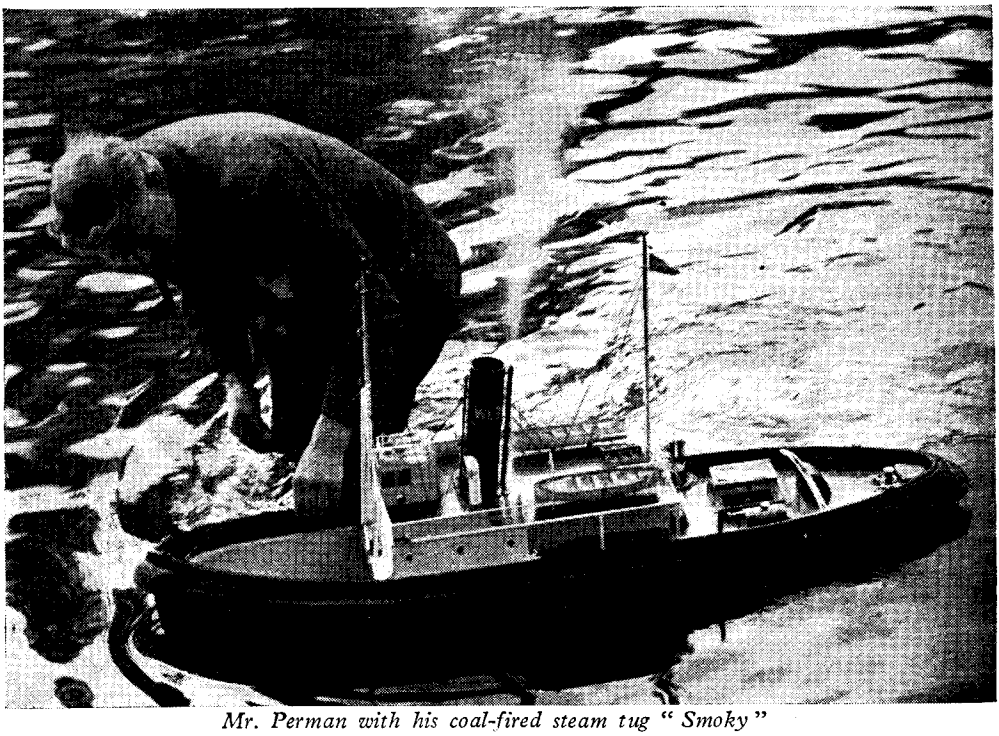
A new competitor, J. Rose (Coventry), managed to secure 3rd place with a nice-looking 15 c.c. four-stroke engined boat, and the ever-popular flash steamer *Vesta* 2 by F. Jutton was second at 41.4 The early laps of this boat were very fast indeed, but *Vesta* 2 faded on the last two laps, which reduced the average speed.

The Steering Competition was the next event, and there is no doubt that the honour of winning the M.P.B.A. Steering Trophy is much desired by all exponents of steering. This trophy, which is a relic of M.Y.R.A. days, was first won in 1911 by G. D. Noble, of Bristol, with *Noble Minor*, and it is pleasing to note that Mr. Noble was present at this year's regatta as a spectator, taking keen interest in the various events.

The steering course chosen was a tricky one ; the targets were some 60 yd. away from the starting position, and not very wide, moreover, competitors, when starting, were not exactly square with the targets. The standard of steering was quite good, and only a comparatively few boats failed to find the targets at least once. The highest score was 13 points by Mr. R. O. Porter's *Slickery* (Victoria), a fine cabin cruiser and a



Mr. R. H. R. Curwen's hard chine cruiser, propelled very effectively by a 15-c.c. four-cylinder " Seal " engine



Mr. Perman with his coal-fired steam tug "Smoky"

very well-known boat. A good effort to beat this was made both by W. Hood (Swindon) with *Truant*, and H. Dowling (Southend) wth *King George V*, both of whom scored 11 points, and these boats took second and third places on the re-run. One of the many tugs seen in the regatta—Mr. Perman's *Smoky*, scored 10; (incidently, this job is coal-fired) and about five others scored 9. Several of the boats that had been entered for the steering could not take part, owing to mechanical trouble; this is a very rare occurrence, and is usually confined to the hydroplane events!

After the conclusion of the Steering Competition, the judges, Messrs. Bowness and Tucker, totted up the score sheet and awarded the "M.E." Prototype Cup to the fine cabin launch *Moiety* made by W. Morss (Victoria). The conditions of the Prototype Cup are that it can only be won once by the same boat, thus all former winners are ineligible; also, the performance of the boats are taken into consideration.

After the Steering Competition came the 500 yd Victory Cup Race for Class "C" boats, and although there was a strong entry, only four boats returned a time. Several boats capsized and others could not be started in the three minute period, thus losing the run. Mr. R. Phillips was unfortunate enough to lose both runs with *Foz* 2, because of the time limit, and C. Stanworth (Bournville) with a new boat *Mephisto* 2 got away to a fast start, but capsized and damaged the hull. This accident also happened to W. Everitt (Enfield) with *Nan*.

R. Mitchell (Runcorn) made two very good runs with *Gamma*, the best of the two at 43.5 m.p.h. and F Walton (Kingsmere), with a new boat, recorded 38.7 m.p.h. to take second place.

The final speed event of the day was the Speed Championship Race for Class "A" boats, and here, although no boats capsized, only half the entries completed the course. It is evident that a tight time limit is nerve-racking to competitors, but if it is persisted in, the long delays during racing events will disappear. The winner was E. Clarke (Victoria), with *Gordon* 2, at a speed of 55.7 m.p.h., and *Big Sparky*, a new Class "A" boat by G. Lines, second at 50.9 m.p.h.

Boats like *Betty*, *Boxotrix*, and *Barracuda* were all unable to reproduce anything but a shadow of their usual speed. K. Williams, with *Faro*, managed to complete two runs, the faster at 40.6 m.p.h. *Faro* has not been running well since a smash at Wallasey earlier in the year. Both the flash steamers entered in the race were withdrawn, *Ifit* 7 with a burst oil-line, and B. Pillinor's *Frolic* sheared the blades right off the highly unconventional propeller of this novel boat.

The Crebbin Trophy thus went to F. Jutton, *Vesta* 2, for his speed of 41.4 m.p.h. in the Mears Race.

Results

75 yd Nomination Race

1. J. Thomas (Blackheath), *Rose*: error 1.8 per cent.

2. R. Brown (Victoria), *S. A. Evarard* : error 2.1 per cent.
3. F. Curtis (Kingsmere), *Korongo* : error 3.1 per cent.

500 *yd. Race for the E.D. Trophy "C" Restricted*
1. L. Pinder (S. London), *Rednip* 8 : 62.9 m.p.h.
2. C. Stanworth Sen. (Bournville), *May* : 43.7 m.p.h.
3. S. W. Poyser (Victoria), *Rumpus* 3 : 42 m.p.h.

500 *yd. Race for the Mears Trophy "B" Class*
1. G. Lines (Orpington). *Sparky* 2 : 55.9 m.p.h.
2. F. Jutton (Guildford), *Vesta* 2 : 41.4 m.p.h.
3. J. Rose (Coventry), *CV.6* : 38 m.p.h.

Steering Competition for M.P.B.A. Trophy
1. R. Porter (Victoria), *Slickery* : 13 points.
2. W. Hood (Swindon), *Truant* : 11 + 3 points.
3. H. Dowling (Southend), *King George V* : 11 + 1 points.

500 *yd. Race for the Victory Cup "C" Class*
1. R. Mitchell (Runcorn), *Gamma* : 43.5 m.p.h.
2. F. Walton (Kingsmere), —— : 38.7 m.p.h.
3. L. Pinder (Kingsmere), *Rednip* 7 : 37 m.p.h.

500 *yd. Race for the Speed Championship Cup "A" Class*
1. E. Clark (Victoria), *Gordon* 2 : 55.7 m.p.h.
2. G. Lines (Orpington), *Big Sparky* : 50.9 m.p.h.
3. K. Williams (Bournville), *Faro* : 40.6 m.p.h.

Prototype Cup
W. Morss (Victoria), *Moiety*.

Crebbin Trophy
F. Jutton (Guildford), *Vesta* 2.

Mr. Rose (Coventry) with his 15 c.c. four-stroke engined boat

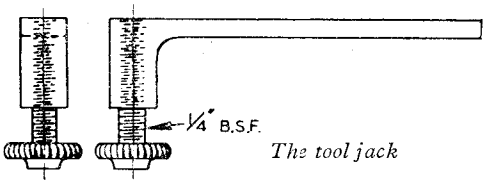
Winner of the "M.E." Prototype Cup : the petrol-driven cabin cruiser "Moiety," by Mr. W. Morss (Victoria)

Less Chatter, Please

WITHOUT a doubt, every turner has a certain amount of trouble parting-off metal in the chuck. We amateurs seem to suffer most, principally on account of the size of machine we use ; but even the professional turner with the best of equipment, still seems to have a fair amount of bother.

There have been many toolholders and gadgets described in various forms which give added rigidity to the tool, but all I have seen have never bothered to get over, to my mind, the principal cause of the trouble ; that is deflection of the top-slide when used in its normal position.

We know, of course, that it is preferable to



The tool jack

turn the top-slide parallel with the chuck, but with many small lathes this is tedious to perform owing to having to shift the clamp-bolts. Also, it is advised to use a rear toolpost, turning the parting tool upside down. This is all very well if we have one, but on many jobs they are apt to get in the way.

Having a fair amount of parting-off to do, I decided that something would have to be done about this chatter, so I made the little tool illustrated, which has completely banished all my troubles.

I use ordinary "Eclipse" or "Darwin Toledo" parting-off blade type cutters, just clamped under the toolpost with my tool jack placed underneath, which is so made as to give correct height to the tool. I have had no bother with the tools tipping sideways ; and for speed of changing, find it perfectly satisfactory.

Of course, to take the matter to its logical conclusion, one could make a holder on the Armstrong or Jones and Shipman principal, and fit it with the elevating screw to give the support under the tip of the tool, which is the main object of the whole principle ; but still not as good as the method described, for the simple reason that the tool has to project from the holder and would not be supported under its tip.

I now use this support for nearly all screwcutting, especially square and Acme threads, and find that it gives excellent results. When turning cranks, it really comes into its own ; using slow speed, there is very little fear of a dig in.

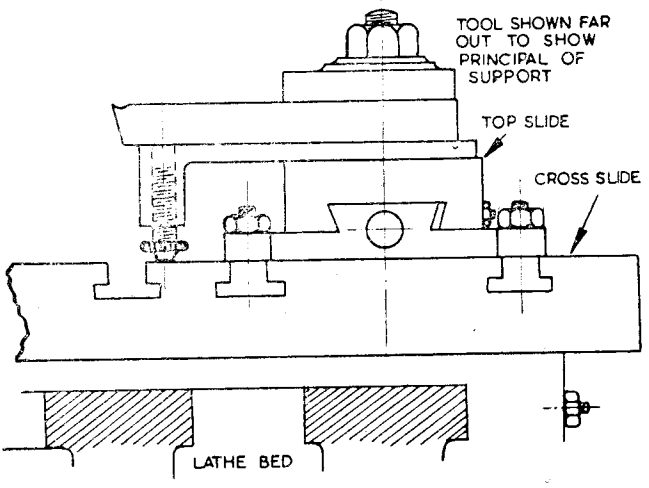
Its main points are ease of adjustment, and, secondly, which is the most important of all, complete rigidity of the tool, taking the load immediately under the cutting point.

One presumes, of course, that the tool is correctly ground, and that the lathe bearings are correctly adjusted ; if not, well, one cannot expect to turn true. I have a shrewd suspicion, however, that this jack would help a lot by eliminating one of the sources of trouble, i.e., tool deflection.

I am not giving any dimensions, as they are fixed by the size and make of the lathe, but anyone can see how it works and how best to adapt it for their own use.

My advice to all who use lathes is to try it ; I am sure that they will find it most useful and well worth the small effort needed to make it.—

TIM.



Sketch showing the jack in position on the top-slide

TEST REPORTS

Some expert comments upon items submitted by the trade

The Kerry Eight-speed $\frac{5}{8}$-in. Capacity Drilling Machine

IN the small workshop, where a single drilling machine often has to serve for all drilling operations, there may be difficulty in obtaining a low enough speed for driving the largest drills.

On the score of expense, the larger sizes of drills are often of the carbon-steel variety, and these for most purposes have to be driven at only half the speed of high-speed steel drills. For example, manufacturers recommend that their $\frac{1}{2}$ in. dia. carbon-steel drills should be run at approximately 225 r.p.m. when drilling hard cast-iron. Again, a low-speed drive is preferable for most countersinking and spot-facing operations.

These considerations have clearly been taken into account in designing the Kerry drilling machine, of $\frac{1}{2}$ in. chuck capacity, submitted for test by the manufacturers, Kerry's (Engineering) Co. Ltd., Grange Road, Leyton, London, E.10, for in this machine a backgear is fitted so that eight spindle speeds, ranging from 86 r.p.m. to 3,360 r.p.m., are readily obtained.

The low spindle speed also enables machine-tapping operations to be carried out when a tapping attachment is fitted.

As shown in the illustrations, the machine is supplied either as a bench model or as a pillar machine to stand on the floor.

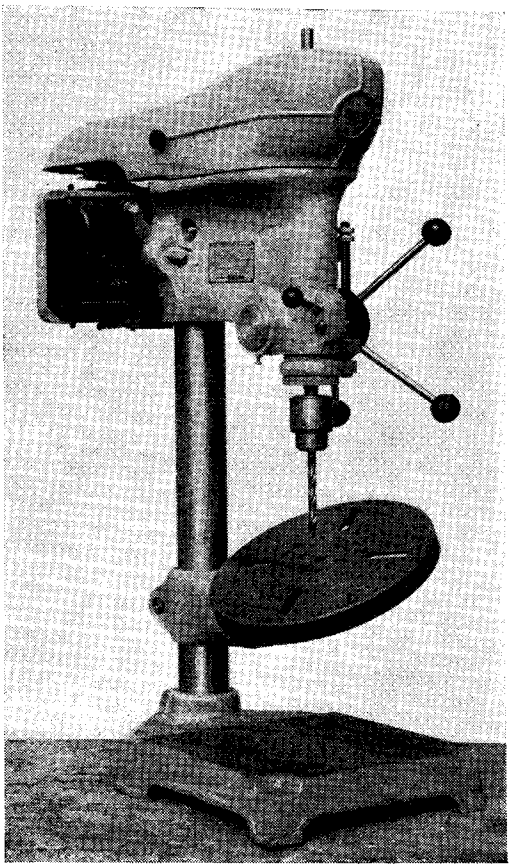


Fig. 1. The Kerry bench drilling machine

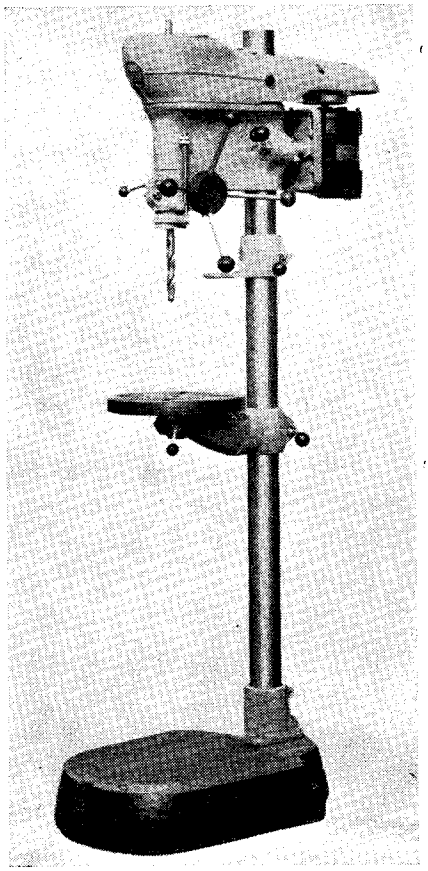


Fig. 2. The pillar model

General Construction

The part-sectional drawing, Fig. 3, shows that the spindle is carried in two ball-bearings that are designed to take both the thrust and radial loads. The lower end of the spindle is bored No. 2 Morse taper and, with a view to maintaining rigidity, the spindle does not project beyond the lower bearing.

The usual type of rack and pinion gearing is employed for the feed mechanism operating the quill, and the tension of the return spring is adjustable. The quill can be locked in position by means of a small clamp lever, and the depthing stop fitted is graduated so as to serve as a depthing scale.

The ⅓ h.p. driving motor is mounted on a spring-loaded, sliding table to enable the belt tension to be released when changing speed. A bronze sleeve and ball-bearings are used for carrying the spindle belt pulley and its backgear. The backgear gives a reduction ratio of approximately 7 to 1, and is readily engaged by turning a knurled finger-nut.

The machine head, as a whole, can be raised or lowered or swung to one side when a locking lever is released, and a safety collar is fitted to the column to keep the head from falling accidentally.

The 12 in. dia. work table is made to revolve and can also be fully tilted to either side.

Machine Details

When the machine was dismantled for inspection, it was found that the main spindle assembly was highly finished and the bearings accurately fitted. The teeth of the cast-iron backgear wheels appeared to be accurately cut, and the gear as a whole ran quietly. The backgear lay-shaft, with its integrally-cut gears, runs on an eccentric shaft carried in well-fitting Oilite bushes. It was noticed, however, that the eccentric shaft appeared to be made from stock bar machined only at its ends. The bullwheel lock is by means of a simple plunger, but this arrangement is apt to be noisy when the machine is running light. The tilting table has a zero mark as an aid to resetting in the level position, but the makers state that this should not be relied on ; presumably, the table will have to be aligned by applying a turn-round test with the test indicator mounted on the machine spindle.

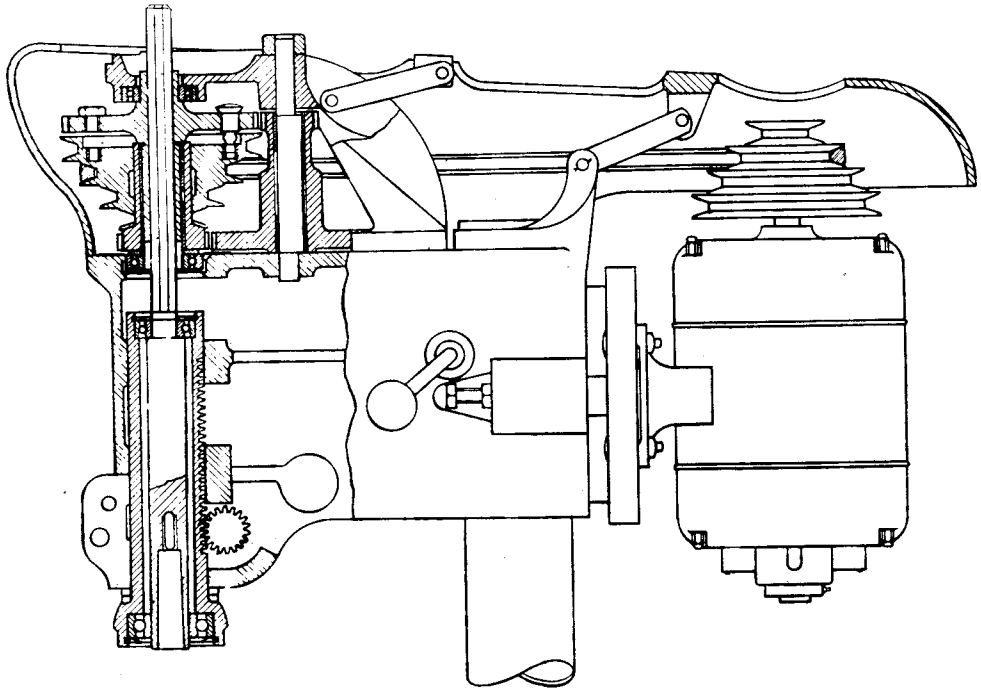


Fig. 3. Showing details of the spindle mounting and backgear

The slides of the motor mounting were very stiff, but worked freely after the parts had been dismantled and thoroughly cleaned.

Shifting the driving belt would be made easier if a lever mechanism were fitted to actuate the motor slide. Much swarf was found in nearly all the tapped holes, and the manufacturers might possibly consider using an air-blast to clean the work after threading. The machine is very well painted externally, but the internal surfaces of the head castings have not been given the customary coat of paint ; in this connection, we understand that the makers use a special cleansing process to free the castings from moulding sand, but, unless the work is carefully checked, any remaining sand grains may cause serious damage, necessitating renewal of the affected working parts.

The lubrication system appears to be well arranged, and Oilite bushes are fitted to the back-gear components. It might, however, be an improvement if a trough were fitted below the high-speed backgear wheels in order to keep the lubricant where it is required, instead of being flung over other parts of the machine.

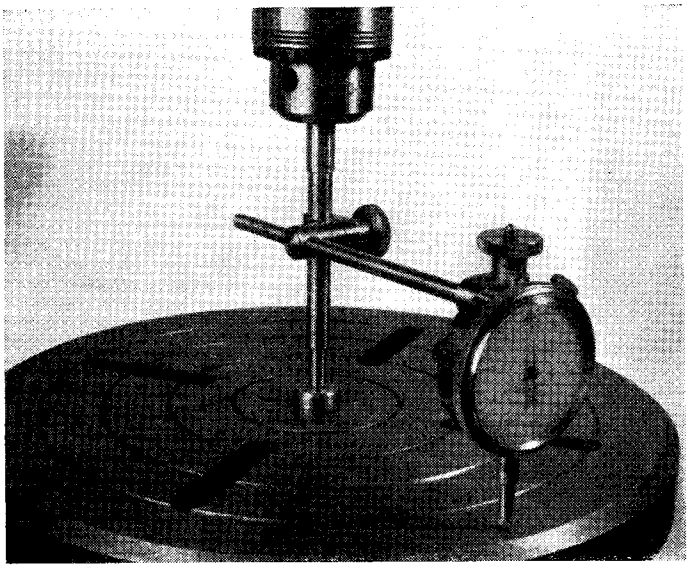


Fig. 4. Carrying out the turn-round test

Accuracy Tests

A turn-round test was carried out with the test indicator mounted in the drill chuck, as illustrated in Fig. 4. This showed that there was accurate alignment from side to side, but the front of the table was 2½ thousandths of an inch higher than at the back ; this slight error is all to the good, for the front of the table tends to sink as wear takes place.

The lack of alignment between the spindle and the front of the main column amounted to 1½ thousandths of an inch in 4½ in., but, here again, the error was in the right direction and would tend to be offset by wear.

The accuracy of the Morse taper bore in the spindle nose was next tested in the way shown in Fig. 5. At its mouth the hole ran ½ thousandth of an inch eccentric, but at the upper part the bore was quite true. When the true-holding of the Belco drill chuck was tested, with the test indicator making contact with a short length of ground rod, the following results were obtained :—

Dia. of rod	Eccentricity
¼ in.	0.0025 in.
5/16 ,,	0.0020 ,,
⅜ ,,	0.0015 ,,
7/16 ,,	0.0010 ,,
½ ,,	0.0015 ,,

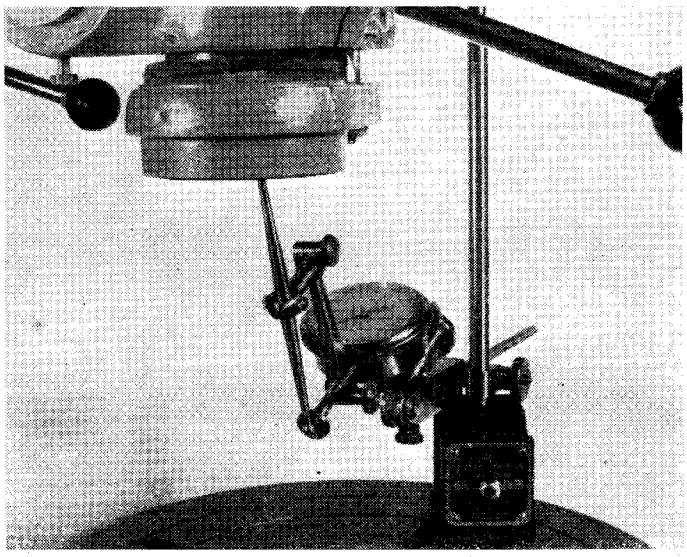


Fig. 5. Testing the spindle taper bore

Conclusion

This well-made machine of robust construction and straightforward design is sufficiently accurate for all ordinary workshop use, and there appears to be no reason why, with proper attention and handling, a long working life may not be expected.

The wide speed-range, together with the high torque at low speeds, make this backgeared machine tool much more serviceable and adaptable than the ordinary direct-driven machine running at relatively high speed.

PRACTICAL LETTERS

Midland Railway History

DEAR SIR,—Referring to the letter from Mr. J. A. Birks published in the "Practical Letters" columns of THE MODEL ENGINEER dated August, 16th 1951, it would appear that after studying the following references, the details given therein are not quite accurate.

The writer has a copy of *The Midland Railway*, by F. S. Williams, 1877, wherein on page viii of the Preface is stated "How the Midland Railway originated in a village inn in the necessities of a few coal owners," and on page 8 of the same volume is a woodcut of the Sun Inn (Eastwood) under which is printed "Birthplace of the Midland Railway."

As the volume from which the above is extracted is a *second* edition, surely a correction would have been made if any error existed in the first edition.

Yours faithfully,

Mansfield. J. B. S. POYSER.

War Surplus Rotary Transformers

DEAR SIR,—There have been numerous articles and letters in THE MODEL ENGINEER about methods of converting these into mains-driven motors, but I have not seen any reference to what seems to me to be the best method.

Practically all of them are wound for an input of low voltage and high current, consequently the field coils have few turns of thick wire, the high current being the major fact or in providing the necessary ampere-turns.

When this field winding is placed in series with the H.T. armature winding the high resistance of the latter cuts down the current severely and the few turns of the field winding carry a very greatly reduced current. Consequently, the motor has a very weak field. This gives the armature little to react with and the motor has an extremely feeble torque. On the other hand, in order to develop a reasonable back E.M.F., it runs often at a dangerously high speed unloaded.

I would illustrate my point with my experience with a convertor, particulars of which are : Input 9.3 V, 23 A ; Output 7.2 V, 13 A, 225 V, 0.11 A.

After removing both pairs of L.T. brushes and placing the field in series with the H.T. brushes, the motor ran at a very high speed indeed unloaded, but had insufficient torque to drive a commercial grinding-head whose bearings were just a little stiff, but which could be driven quite easily by treadle.

A friend measured the resistance of the armature between the H.T. brushes and said it was 175 ohms. Obviously the field windings were getting about 1 1/3 A instead of the 23 necessary for full excitation, and it seemed to me (being on d.c. not a.c.) that the obvious course was to rewind the fields with as many turns as possible of wire that would just safely carry one ampere.

Omitting details of unsuccessful efforts, I finally succeeded in fitting to the field magnet two former-wound coils of 400 turns each (800 in all) of 26-gauge enamelled wire.

I was advised to use Lumex Grade T (usual disclaimer) which has thicker insulation than ordinary enamelled wire.

The machine has a short $\frac{3}{8}$ in. diameter shaft protruding, of which half is plain and half threaded $\frac{3}{8}$ B.S.F. and there is a short $\frac{1}{2}$ in. shoulder next the bearing.

A $\frac{1}{4}$ in. thick, 3 in. grinding wheel was clamped on this between $\frac{1}{16}$ in. thick steel washers with the usual paper washers, and the result is a most effective tool grinder with greatly increased torque. Mild-steel tools can be pressed against the wheel quite firmly without slowing it up unduly.

From the way it grinds I estimate that its speed is about high enough for a 3 in. wheel (4,000 to 5,000 r.p.m.)

Approximately half an hour's grinding was sufficient to convert a $\frac{3}{8}$ in. sq. mild-steel tool bit into a R.H. knife tool for steel, and neither field nor armature showed any signs of warming up.

Hoping that this may be of interest to other amateurs.

Yours faithfully,

Birkenhead. A. E. HEPWORTH.

Model Organ Building

DEAR SIR,—I read with great interest Mr. Brewer's description of his latest model organ console in the issues of July 12th and 19th. I have attempted two model organ consoles myself, since one of my hobbies is music, especially in connection with organs, and the other is woodwork. There are one or two points which may interest Mr. Brewer, although he is by far my superior in experience.

My consoles are of the ecclesiastical type, and the latest one is a model of a console of the 1925-1930 period when consoles were, as a general rule, clumsy and larger than they had to be. The console is in French polished mahogany with a panelled outside case of light oak. There are four manuals, the white notes of which are made of white celluloid rulers with the markings removed; the black notes are made of ebonite. There are one-hundred and forty stop knobs (including couplers, etc.), which I made out of barbola paste. I first turned a master stop and from it made ten moulds out of fire cement. I then moulded the stops ten at a time and finished and painted them.

I obtained my measurements from Rev. Noel A. Bonavia-Hunt's book *The Modern British Organ.*

I must end by saying that I have learnt a lot from Mr. Brewer's article and I particularly congratulate him on making a pedal-board which "works," although I feel that he has made the sides of the pedal-board too thin. I think this criticism holds also for the sides of the manuals and the flat board on which they rest, otherwise the model is excellent.

Yours faithfully,

Dorchester. J. H. H. WILLIAMS.

Advice on Brazing

DEAR SIR,—Being a coppersmith by trade, as well as a keen modeller, I'm rather dismayed to find many fine mechanical models spoilt by bad pipe work, and untidy and faulty brazing. I have found, too, a few cases, where a reasonably good job has been made.

This has set me wondering, if by the means of your excellent magazine, you could inform readers of my name and address. I would only be too pleased to give some practical advice and help on this branch of modelling. I have worked on full-size locomotives, and all branches of marine engineering, oil, diesel engines, steam turbines, and the triple expansion engine. At present I'm working on turbo-alternators. I have also used oxyacetylene apparatus for over fifteen years, for silver-soldering, Sif bronzing, and mild-steel welding.

Naturally, no charge would be made for this assistance, only a stamped envelope for a reply.

Yours sincerely,

18, Chatton Street, G. CANDLISH.
East-Howdon-on-Tyne,
Northumberland.

"That Wonderful Year . . ."

DEAR SIR,—This series of articles has certainly been interesting and instructive, since many novel forms of steam engines exhibited at the Great Exhibition have been well illustrated by copies of the original wood-engravings.

The compiler of the articles is to be warmly complimented for both selection and clever presentation of the subject matter of the articles.

A fact often overlooked is that, many of the mechanical features of present day internal combustion engines were developed by the steam engineers of the early 19th century.

Whilst the 1851 Exhibition is still under consideration, you may be interested to know that a great advance was made in the development of the electric clock by Charles Shepherd. In fact, it was decided to keep the time at the exhibition by the Shepherd system, and a large clock dial was erected in a prominent place.

Yours faithfully,

Cannock. H. R. LANGMAN.

A Workshop Engine

DEAR SIR,—Looking over THE MODEL ENGINEER for May 17th last I notice Mr. Andrew Smith of Bristol mentions the sort of workshop engine he would like. If he can get hold of a second-hand Hartop horizontal gas or oil engine, he will have all the polished brass, etc., he wants. He will not get a new engine, as the original makers have retired, though one still runs a workshop, but only as a hobby. I ran one of these engines for years. It was 3 in. bore and I mostly ran at 750 r.p.m. and occasionally at 1,000. As supplied, she was fitted with one straight-armed flywheel. I like to see two flywheels on a small engine of this type, so the makers kindly found a curved arm pattern and fitted me two. Polished brass were sight feed and main bearing lubricators, complete governor gear, rocker arms and main bearings. Also, contact-breaker in my case, as I used the old type trembler coil and battery. Polished steel and iron were flywheel rims, side shaft, crank and inboard end of cylinder liner. Added personal fads were a dural con-rod with automatic lubrication to big-end, an alloy piston, a fitted plate in the crank pit to catch surplus oil and lead it outside the engine bed, a beaded edge splash catcher over the crank and con.-rod, and my own pet inlet and exhaust cams. Paint was one coat primer and two coats medium green enamel and the lining was vermillion and gold. No swank about that. I used cycle lining transfers and excellent I found them. My only regret was that one cannot bend these transfers, so I could not line the curved arms of the flywheels. Most of the building of her I did on a $3\frac{1}{2}$-in. Drummond, and the heavy work was done for me by the makers. Although on the point of efficiency per bore and stroke she may not compare well with Mr. Westbury's designs, she was a steady slow speed reliable job. So if Mr. Smith can get such an engine he will have his heart's desire. Good hunting to him, anyway.

Yours sincerely,

Luton. ERNEST W. FRASER.

A Rare Accident

DEAR SIR,—With reference to the "Smoke Rings" in your August 30th issue, I note that you make reference to a rare accident which occurred in connection with a boiler, near Halifax, Yorkshire. I happen to know the details of this particular occurrence, and I thought it might be of interest to readers to know that the accident was caused by the valve seat moving bodily in the safety-valve casting, allowing it to lift with the valve itself. As the valve seat rose with the valve, there was no orifice at which the steam could escape until the seat was blown clean out of the casting. The force then was such that the dead weights and carrier were blown clean off the top of the safety-valve and fell down beside the boiler. The rapid release of steam through the open valve-seat orifice was such that it impinged on the boiler-house roof, lifting the slates and scattering them over a considerable area.

It is interesting to note that a new valve seat had been put in the safety-valve shortly before the mishap, but it had not been a satisfactory fit, nor had any means been taken to pin the seat in the body and thereby prevent any possibility of it lifting.

The reason why the seat lifted at a pressure less than the normal working pressure of the boiler was that the area over the outside of the valve-seat was greater than that area of the valve itself, which is normally exposed to the steam pressure. Thus with the steam acting on a larger area the valve and seat lifted at lower pressure.

It should not have been possible for the weight carrier to be blown off the valve-casting, but there was some defect in the lugs which made this possible in this particular instance.

Yours faithfully,

R. H. PROCTER.
Hon. Sec., Tonbridge Model Engineering Society.